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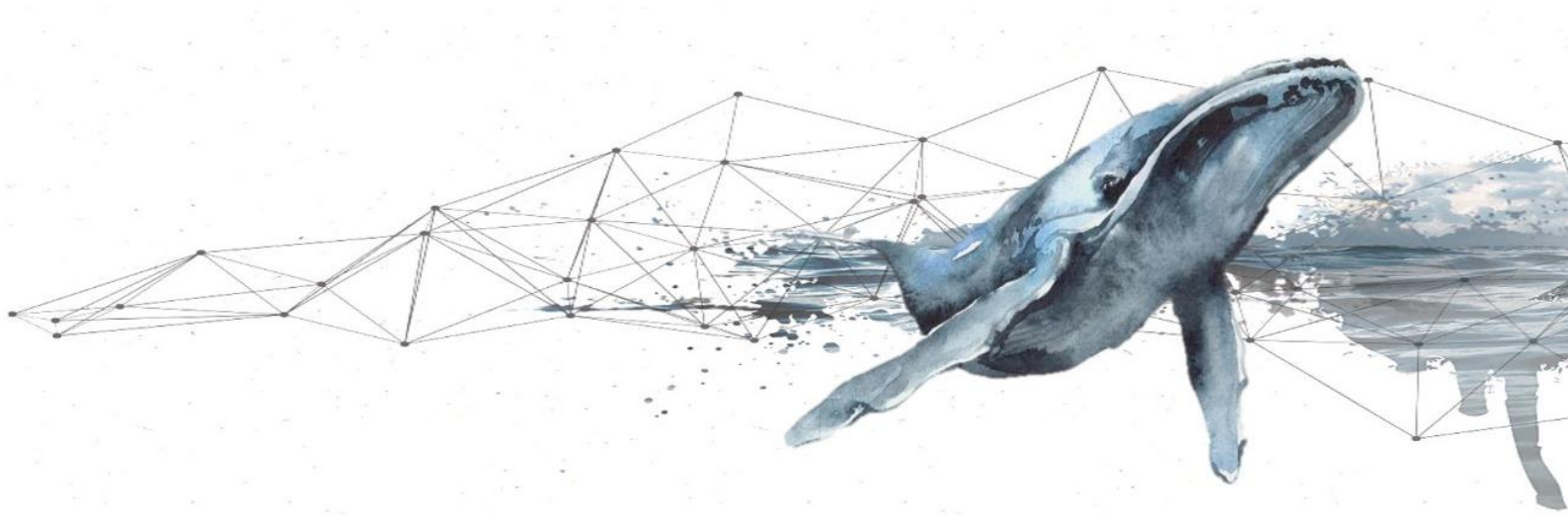
CONSERVAÇÃO DE CETÁCEOS NO OESTE DO ATLÂNTICO: COLABORAÇÃO, AÇÃO E EFETIVIDADE



ILHÉUS - BAHIA
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Tese apresentada ao Programa de Pós-Graduação em Ecologia e Conservação da Biodiversidade da Universidade Estadual de Santa Cruz como parte dos requisitos para obtenção do grau de Doutora em Ecologia e Conservação da Biodiversidade.

Área de concentração: Ações e planejamento em conservação da Biodiversidade.

Orientador: Dr. Leonardo de Carvalho Oliveira
Coorientadores: Dr. Alexandre Schiavetti e Dr. Yvonnick Le Pendu

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"Valeu a pena estudar heim!". Te dedico vô.

Barbara Taylor ©

"-What hopeful things do you see in the future for cetaceans' conservation?

B: I think the most hopeful things are the animals themselves. I have a great deal of faith in the animals. I think that we just have to look to ourselves to be more proactive on doing some research to get us through the coming decades. We have to strike a balance between being an unrealistic-optimist and an unrealistic-pessimist, you need to be what I call a pragmatic-optimist, to be practical about what you are facing but be optimistic that the animals if you give them a chance, it will do just fine

We just don't know what, and where is going to happen, but we do know that there will be some unpleasant surprises and we just have to work hard as marine mammal scientists to learn as much as we can, as fast as we can, so that we can be prepared."

Dr. Barbara Taylor

NOAA researcher and chair of the Marine Mammal Society's Conservation Committee

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CONSERVAÇÃO DE CETÁCEOS NO OESTE DO ATLÂNTICO: COLABORAÇÃO, AÇÃO E EFETIVIDADE

RESUMO

O interesse na conservação de cetáceos teve início principalmente na década de 70 após a primeira conferência internacional dedicada exclusivamente aos mamíferos marinhos. A partir desse ano, as Organizações Conservacionistas (Organizações governamentais, não governamentais e do terceiro setor) e pesquisadores tiveram um papel fundamental na preservação e recuperação de espécies de cetáceos em todo mundo. Com o intercâmbio de habilidades e diferentes perspectivas, as redes de colaboração trazem melhorias na qualidade de pesquisa e sucesso nas ações de conservação. A partir da observação da necessidade de uma melhor comunicação entre acadêmicos e atores da conservação bem como da necessidade de determinar potenciais temáticas e parcerias para alcançar bons resultados na conservação, delineamos a presente pesquisa. Primeiramente, realizamos uma compilação sistemática da bibliografia das pesquisas publicadas entre 1986 e 2016 para compreendermos o cenário das ameaças antrópicas sobre cetáceos. Determinamos onde, como e por quem essas pesquisas vêm sendo realizadas no Brasil e desenvolvemos uma rede de colaboração científica entre as afiliações envolvidas. Também mapeamos as instituições envolvidas e as áreas de estudo dessas pesquisas. Os estudos envolveram 82 instituições de 12 países e foram realizados principalmente nos estados do Rio de Janeiro (22%), São Paulo (20%) e Rio Grande do Sul (13%). A maioria das publicações foram voltadas à Odontocetos especialmente *Sotalia guianensis* (N=50) e *Pontoporia blainvillei* (N=38). Os estudos com misticetos abordaram principalmente a *Megaptera novaeangliae* (N=6) e *Eubalaena australis* (N=5). Entre as ameaças abordadas, mais da metade dos estudos foram sobre poluição (54%), seguido por captura incidental (19%) e tráfego de embarcações (11%). Seis instituições tiveram maior influência na rede de colaborações e suas localizações correspondem a *hotspots* de biodiversidade de cetáceos. O segundo maior objetivo da presente tese foi determinar o panorama de quem são as Organizações Conservacionistas que apresentam ações voltadas aos cetáceos e analisar quais fatores influenciam na efetividade da conservação desses organismos. Para isso, aplicamos entrevistas aos representantes-chave de Organizações da Argentina, Brasil, Estados Unidos da América e Uruguai. As Organizações atuam principalmente na conservação de *Tursiops truncatus*, (N=27) *Megaptera novaeangliae* (N=25), *Orcinus orca* (N=25), e *Eubalaena australis* (N=25). Captura incidental e lixo marinho foram as ameaças mais relatadas. Nossas análises mostraram que os principais fatores que influenciaram diretamente na efetividade de conservação foram: nível de recurso financeiro, tamanho da equipe, atuação em diferentes escalas geográficas, quantidade de espécies pesquisadas, quantidade de publicações, intensidade de colaboração e quantidade de vertentes de trabalho. Também verificamos que as redes de colaboração entre as Organizações apresentam fracas ligações. As maiores dificuldades mencionadas pelas Organizações foram, captação de recursos financeiros e interesse político nos níveis federal, estadual e municipal. Em última análise, os resultados dessa tese contribuem para identificação de prioridades de pesquisa e ação e norte para uma conservação efetiva dos cetáceos no Oeste do Atlântico. Nossa abordagem é uma iniciativa para impulsionar parcerias e auxiliar as Organizações a aumentarem o sucesso de conservação de cetáceos.

Palavras-chave: Organizações Ambientais; Preservação de cetáceos; Impactos antrópicos; Redes de colaboração científica; Eficácia de conservação.

CETACEANS CONSERVATION IN WESTERN ATLANTIC: COLLABORATION, ACTION AND EFFECTIVENESS

ABSTRACT

Concerns about the conservation of cetaceans started mainly after the first international conference on marine mammals studies, in the 70's. Since them, Conservation Organizations (governmental organizations, non-governmental organizations, and non-profit organizations) and researchers have played an important participatory role in the cetaceans' preservation and recovery worldwide. Collaboration networks can improve the quality of research and the success of conservation actions as they enable the exchange of approaches and expertise. From the assumption that academics and conservation' makers lack in weak collaboration, and recognizing the need for determining main topics and potential partnerships to reach cetacean conservation outcomes, we designed this thesis. We first conducted a systematic bibliographic compilation of published scientific studies from 1986 to 2016 to a better understanding of threats posed by human activities on cetaceans. We determined where, how, and by whom the research on this subject has been conducted in Brazil. Then, we developed a collaboration network among the authors' institutions and generated a distribution map of the investigated threats and study areas. The studies were carried out by 82 institutions from 12 countries. Most of the study areas took place in the states of Rio de Janeiro (22%), São Paulo (20%), and the Rio Grande do Sul (13%). Most of the publications were about Odontocetes, mainly with *Sotalia guianensis* (N=50) and *Pontoporia blainvillei* (N=38). About the mysticetes, studies aimed mainly on *Megaptera novaeangliae* (n=6) and *Eubalaena australis* (n=5). Among the addressed threats, more than half of the publications focused on pollution (54%), followed by bycatch (19%) and vessel traffic (11%). Six institutions were the most prevalent in the scientific collaboration networks, and their location corresponded to hotspots of cetacean diversity. The second major goal of this thesis was to determine the real dimension of who are the Organizations working on cetacean conservation and examine which factors influence the cetaceans' conservation effectiveness. From questionnaires surveys, we investigated Conservation Organizations concerned with cetacean conservation from Argentina, Brazil, the United States of America, and Uruguay. The Organizations aimed mainly at the conservation of *Tursiops truncatus*,(N=27) *Megaptera novaeangliae* (N=25), *Orcinus orca* (N=25), and *Eubalaena australis* (N=25). Bycatch and marine debris were the main threats reported. The analysis revealed the main attributes that influence the effectiveness of cetacean conservation: level of financial resource, number of staff, variety of spatial extent of action, number of studied species, number of publications, the intensity of collaboration, and number of fields of work. We also found that the Organizations' collaboration network represents weak bridges. The main difficulties mentioned by the Organizations were the fund-raising and lack of political influence of governments at all levels. Our findings contribute to identifying research priorities and actions that need to be addressed and guide an effective conservation of cetacean species in the Western Atlantic. Our approach is an initiative to stimulate broad, strengthen the partnerships, and help the Organizations improve the success of cetaceans' conservation.

Keywords: Environmental Organizations; Cetacean recovery; Human impact; Research collaboration; Conservation effectiveness.

SUMÁRIO

I. INTRODUÇÃO GERAL

Os cetáceos desempenham um importante papel ecológico, pois devido ao seu grande tamanho e abundância, estabilizam e garantem um sistema ecológico produtivo saudável (LODI & BOROBIA, 2013). Esses organismos apresentam ainda um importante papel social e econômico no turismo de observação (*whale* e *dolphin watching*), que dá subsídios socioeconômicos para 119 países, gerando mais de 2 bilhões de dólares e fornecendo emprego para mais de 13.000 pessoas (O'CONNOR et al. 2009). Contudo, as suas características biológicas determinam uma maior vulnerabilidade em relação a outros grupos animais, pois são espécies de crescimento lento, apresentam baixas taxas reprodutivas e são potenciais bioacumuladores de compostos tóxicos (DURANTE et al. 2020; ROCHA-CAMPOS et al. 2011).

Devido ao elevado impacto antrópico em seus hábitats, os cetáceos também estão em ameaça recorrente. Atualmente, mais da metade da população humana mundial vive em áreas costeiras e adjacentes, o que gera diretamente expressivas alterações negativas nesses ecossistemas (BURKE et al. 2000; VITOUSEK, 1997). Os ecossistemas marinhos são amplamente prejudicados pela combinação de diversos impactos de origem antrópica como perda e degradação do habitat, poluição química e sonora, e sobrexploração dos recursos naturais (LOTZE et al. 2006; WORM et al. 2006). Já ecossistemas fluviais apresentam uma alta densidade humana e maior densidade de atividades de pesca e degradação dos recursos naturais, assim, animais que habitam esses ambientes são considerados ainda mais ameaçados (ARAÚJO et al. 2007).

Outra grande ameaça antrópica em áreas marinhas, afetando especialmente as baleias, foi a caça predatória. Desde a colonização europeia até o século XX, o oceano Atlântico foi um dos principais palcos de caça de baleias em escala industrial. Estima-se que entre 1830 e 1924, até 32.000 baleias-jubarte (*Megaptera novaeangliae*) podem ter sido caçadas no nordeste do Brasil (DE MORAIS et al., 2016) e, entre 1960 e 1968, cerca de 1.630 baleias-franca (*Eubalaena australis*) foram mortas no Atlântico Sul (PALAZZO JR., 2006). Desde a moratória da caça comercial que entrou em vigor em 1986, a caça comercial da baleia está suspensa nessa região (SMITH, 1984). Entretanto, ainda pode ser praticada por países que apresentam permissões especiais (i.e. Japão, Noruega e Islândia) e por frotas que violam legislações de proteção já estabelecidas para o Atlântico Sul (IWC, 2016).

Devido à preocupação com a vulnerabilidade e exposição dos cetáceos a tantas ameaças, em 1970 iniciaram-se os primeiros movimentos mundiais para conservação desses animais (CORKERON, 2004; PINEDO & CASTELO, 1980). Em 1981, a Sociedade para Estudos de Mamíferos Marinhos (The Society for Marine Mammalogy - SMM) foi fundada nos Estados Unidos da América e subsidia conferências bianuais conectando pesquisadores de todo mundo (BIRD, 1997). Em 1996 foi criada a Sociedade Latino Americana de Especialistas em Mamíferos Aquáticos (SOLAMAC). No Brasil, em 1997 a primeira versão do Plano de Ação para os Mamíferos Aquáticos foi publicada. A partir de 2010, com o intuito de orientar e estabelecer as ações prioritárias para a conservação de cetáceos ameaçados novos Planos de ação nacionais (PANs) foram elaborados (ver ROCHA-CAMPOS et al. 2011; BRASIL, 2010; DI BENEDITTO et al. 2010; ROCHA-CAMPOS et al. 2010).

Além disso, desde 1998, a criação de um Santuário de Baleias do Atlântico Sul (South Atlantic Whale Sanctuary – SAWS), vem sendo defendida nas plenárias das reuniões da Comissão Internacional Baleeira (CIB) (PALAZZO JR, 2006). Copatrocinado por diversas Organizações ambientais da Argentina, Brasil, Gabão, África do Sul e Uruguai, o projeto para o SAWS visa evitar que a moratória da caça seja derrubada e garantir proteção integral aos cetáceos do Atlântico. Além disso, áreas específicas para proteção e monitoramento dos cetáceos estão sendo identificadas em todo o mundo. Um exemplo são as "*Important Marine Mammal Areas*" (IMMAs), estabelecidas pela *Marine Mammal Protected Areas Task Force* da *International Union for the Conservation of Nature* (IUCN), que consistem em porções de habitat críticos para espécies de mamíferos marinhos que requerem atenção especial e devem ser consideradas em decisões governamentais, conservacionistas e sociais.

Porém, ainda que estratégias de pesquisa sejam traçadas e áreas protegidas sejam implementadas, um monitoramento constante e conscientização ambiental são de suma importância para proteção dos cetáceos. Apesar de muitas pesquisas empíricas mencionarem sugestões de aplicações práticas de manejo, poucas dão atenção ao levantamento e investigação das estratégias de ação que vem sendo realizadas para a conservação dos cetáceos. Para isso, priorizar e coordenar os esforços entre Instituições de pesquisa, Organizações Não Governamentais, Organizações Governamentais e Universidades é um passo fundamental.

Neste sentido, para possibilitar a identificação de melhores caminhos para conservação de cetáceos e um direcionamento mais efetivo dos esforços, delineamos a

presente pesquisa. Esse projeto também foi motivado pela observação de que existem falhas de comunicação e colaboração entre os atores de conservação de cetáceos, que dificultam que resultados reais sejam alcançados na preservação desses animais. Buscou-se dar o primeiro passo por meio do levantamento das pesquisas e Organizações existentes. Além disso, lacunas de estudo e ação foram identificadas, e fatores importantes para uma conservação mais efetiva foram analisados.

Esse estudo também englobou dois dos objetivos do SAWS: integrar a pesquisa nacional, os esforços de manejo e estratégias de conservação em uma estrutura cooperativa, maximizando a eficácia das ações de gestão; e fornecer um quadro global para o desenvolvimento de medidas localizadas, a fim de maximizar os benefícios de conservação em nível da bacia oceânica (IWC, 2016).

Assim, este trabalho foi estruturado em dois capítulos. No Capítulo 1, intitulado "Redes de colaboração científica em pesquisas sobre ameaças antrópicas aos cetáceos no Brasil" buscamos caracterizar o cenário das pesquisas sobre impactos antrópicos em cetáceos no Brasil. Para isso, realizamos uma compilação bibliográfica sistemática de estudos científicos publicados de 1986 a 2016 e avaliamos a distribuição espacial, temporal e institucional desses estudos, além de determinar quais espécies de cetáceos e temáticas foram abordadas.

No Capítulo 2 intitulado "Avaliação da efetividade de Organizações conservacionistas para conservação de cetáceos no Oceano Atlântico Oeste" buscamos identificar e avaliar a efetividade de Organizações Conservacionistas em relação a conservação de cetáceos. Para isso, entrevistamos representantes de Organizações da Argentina, Brasil, Uruguai e Estados Unidos da América e levantamos aspectos sobre o contexto e ação. Posteriormente mensuramos a efetividade de conservação e verificamos quais fatores foram importantes para o alcance de uma maior efetividade.

Este é o primeiro estudo a investigar as redes de ação e pesquisas sobre a conservação de cetáceos e é pioneiro em investigar a atuação de Organizações Conservacionistas em larga escala. Este trabalho traz lições de como melhorar a efetividade das ações para conservação dos cetáceos e fornece informações para fortalecer as parcerias entre os atores de conservação. Os resultados encontrados podem auxiliar pesquisadores na tomada de decisões de temas e parcerias para futuras pesquisas, além de identificar as espécies e regiões com lacunas de conhecimento.

Espera-se que nosso trabalho contribua como norteador, amplie discussões sobre melhores práticas e possibilite o fortalecimento de parcerias para a conservação de cetáceos no Atlântico.

Ia. OBJETIVO GERAL

Investigar o panorama das pesquisas e ações voltadas a conservação de cetáceos no Atlântico

Ib. OBJETIVOS ESPECÍFICOS

Capítulo 1: Qual o cenário das pesquisas sobre impactos antrópicos em cetáceos no Brasil?

i. Identificar quais instituições conduzem pesquisas sobre impactos antrópicos em cetáceos no Brasil;
ii. Mensurar a colaboração científica dessas instituições;
iii. Caracterizar as pesquisas realizadas em relação aos temas e espécies estudadas;
iv. Avaliar a distribuição geográfica das pesquisas sobre impactos antrópicos em cetáceos no Brasil

Capítulo 2: Quais fatores influenciam na efetividade de conservação de cetáceos no Atlântico Oeste?

v. Identificar e caracterizar as Organizações da Argentina, Brasil, EUA e Uruguai que possuem ações voltadas a conservação de cetáceos
vi. Determinar quais fatores influenciam na efetividade de conservação dessas organizações;
vii. Verificar quais principais dificuldades enfrentadas pelas Organizações para conservação dos cetáceos

CAPÍTULO 1

SCIENTIFIC COLLABORATION NETWORKS IN RESEARCH ON HUMAN THREATS TO CETACEANS IN BRAZIL

SCIENTIFIC COLLABORATION NETWORKS IN RESEARCH ON HUMAN THREATS TO CETACEANS IN BRAZIL

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Abstract

To better understand the threats posed by human activities on cetaceans, we compiled published studies and determined where, how, and by whom the research on this subject has been conducted in Brazil. We also determined which cetacean species were mostly investigated in these studies. We gathered the available scientific literature published from 1986 to 2016 that contained search terms in English that depicted major cetacean threats. Then, we developed a collaboration network among the authors' institutions and generated a distribution map of the investigated threats and study areas. From the 1047 compiled publications, we selected 103 studies that precisely addressed cetacean threats. The selected studies were carried out by 82 institutions from 12 countries. Most of these institutions were universities (n=55), followed by non-governmental organizations (n=15) and research institutes (n=12). Among the two cetacean suborders, odontocetes were the most representative, with *Sotalia guianensis* and *Pontoporia blainvillei* present in 50 and 38 publications, respectively. For mysticetes, publications on *Megaptera novaeangliae* (n=6) and *Eubalaena australis* (n=5) were the most common. Among the addressed threats, more than half (54.4%) of the publications focused on pollution, followed by bycatch (19.4%) and vessel traffic (10.7%). Most of the study areas took place in the states of Rio de Janeiro (22.4%), São Paulo (19.7%), and Rio Grande do Sul (12.9%). Six institutions were the most prevalent in the collaboration networks, and their location corresponded to hotspots of cetacean diversity. Our findings may contribute to identifying research priorities and guide the conservation of cetacean species in Brazil.

Keywords: Human impact; Marine Mammals; Cetacean conservation; Research collaboration; Bibliometry; Brazilian coast.

1. Introduction

Nearly 70% of oceanic regions are severely impacted by humans or are located near key conservation sites for marine and freshwater mammals [1]. The fact that more than half of the world's human population lives in coastal areas has directly fostered negative changes in marine ecosystems [1-3]. Coastal and marine ecosystems are greatly damaged by a synergy of anthropogenic impacts, such as overexploitation of natural resources, habitat loss and degradation, and chemical and noise pollution [4,5].

Cetaceans are especially vulnerable, compared to other groups of marine mammals, because of their slow development, low reproductive rates, and potential bioaccumulation of heavy metals [6]. Commercial whaling and accidental capture have led to the extinction of many cetacean species and populations [7, 8]. For example, the Gray whale (*Eschrichtius robustus*) has been considered functionally extinct in the Atlantic since the early 18th century [7], and the most recent ecological extinction was that of the Baiji (*Lipotes vexillifer*) of the Yangtze River in China in 2002; both extinctions are mainly attributed to hunting [8]. Currently, the Vaquita (*Phocoena sinus*) is the most critically endangered cetacean species in the world, with an estimated

population of 30 individuals, owing to bycatch [9]. In Brazil, the primary threat is fishery activities, especially for the Franciscana (*Pontoporia blainvillei*), which is affected by accidental death events occurring during fishery operations along the south and southern coasts of Brazil [10], and for the Amazon river dolphin (*Inia geoffrensis*) and the Tucuxi (*Sotalia fluviatilis*), which are both directly exploited as bait in the Amazon [11].

Concerns about the conservation of cetaceans worldwide started to increase in the 1970s [12], notably following the first Biennial Conference on the Biology of Marine Mammals that took place in 1975. In 1981, the Society for Marine Mammalogy was founded, which led to subsequent conferences and collaborative initiatives among researchers from several institutions and countries [13]. In 1982, to regulate whaling and conserve whale stocks, the International Whaling Commission (IWC) promoted a global moratorium on commercial whaling and in 1986 it was implemented [14]. The moratorium acted as a decisive factor in the recovery of several populations of mysticetes, nevertheless, Iceland, Japan, and Norway still hunt more than a thousand whales every year by using exceptions in the rules imposed by IWC [15].

In order to reaffirm the national interest in cetacean conservation, the Brazilian coast was decreed as a sanctuary for whales and dolphins in 2008 [16]. To provide proper conservation of whale stocks and ensure that whaling become permanently banned, Brazil and several countries lead a proposal to create a South Atlantic Whale Sanctuary. The proposal has been advocated in the IWC plenary sessions since 2001 [15]. In addition, National Action Plans were created in 2010 to establish and guide priority action for the conservation of cetacean species that are included in the Brazilian list of threatened species [6, 17-19]. These plans are of strategic importance to guide conservation efforts because they have been developed based on collaboration between research institutes, non-governmental organizations (NGOs) and universities. They are an excellent example of the product of a scientific collaboration network, which is defined as the participation of researchers working towards a common goal and the production of knowledge [20]. Collaboration networks can improve the quality of research, as they enable the exchange of approaches and innovations in methodology. Thus, the results can be more reliable and expand conservation strategies for a given species [20]. Collaboration networks can be measured at different levels, namely interpersonal, interdepartmental, interinstitutional, and international.referencia

Based on the need to better understand the status of research regarding the impacts of human activities on cetaceans, we aimed to identify studies on this subject and

determine where, how, and by whom it has been conducted in Brazil, as well as to determine which species of cetaceans have been studied. Thus, we addressed the following questions: (1) Which institutions are conducting research regarding the impacts of human activities on cetaceans in Brazil, and how are these institutions spatially distributed worldwide? (2) What is the status of scientific collaboration networks among these institutions? (3) What types of human threats have been studied, and which cetacean species have been investigated in Brazil? (4) Where are the surveys being conducted in Brazil?

To achieve this aim, we conducted a systematic bibliographic compilation of published scientific studies from 1986 to 2016. These findings will help to guide future conservation actions and help researchers, universities, and NGOs to identify potential research partners focused on the conservation of cetaceans.

2. Materials and Methods

2.1. Defining search terms

A review of the main threats posed by humans to cetaceans in Brazil was conducted using three Brazilian action plans for cetacean conservation [6, 18, 19] and a identification guide book for Brazilian cetaceans [21] as references. The main threats identified in these reference books were then classified into seven categories, namely *vessel traffic* (change in behavior based on vessel traffic), *vessel collision*, *bycatch* (accidental death in fishing nets), *hunting* (intentional capture and slaughter because of resource competition even perceived and real competition), *pollution* (ingestion of marine debris, chemicals and noise pollution), *dam construction* (construction of hydroelectric power plants), *depletion of fish stocks* (temporal variation in the diet, reduction in the availability of prey and overfishing) and *several* (when more than one threat was addressed).

Subsequently, variations of 63 English terms depicting major cetacean threats posed by humans in Brazil were developed. Using a combination of these terms (Table 1), we conducted an initial search for articles published from 1986 to 2016 in two databases, the Web of Science bibliographic platform and the bibliographic database of the Natural History Museum of Los Angeles County [22]. The Web of Science platform was chosen as it is one of the most comprehensive article databases from peer-reviewed journals. The Natural History Museum of Los Angeles County (NHM) database on marine mammal publications contains scientific literature exclusively related to marine

mammals and includes 75,678 references. We excluded publications prior to 1986, the year when the commercial whaling moratorium for large cetaceans was made effective [14] because this historical landmark for the conservation of cetaceans brought about increased interest in these animals in the scientific community (subsequently leading to a high number of scientific publications).

Table 1. Search information and terms used for initial identification of articles focusing on human threats to cetaceans in the bibliographic databases Web of Science and Natural History Museum of Los Angeles County. Symbol - *, named symbol of truncation, is used in the bibliographic search, at the end of the words to find them in the singular, plural and variations of writing of them (recovers any amount of characters, including none).

Sources of bibliographic data	Web of Science bibliographic platform (http://isiknowledge.com/) and the bibliographic database of the Natural History Museum of Los Angeles County
Period of publication	Between 1986 and 2016
Search field	Topic (article titles, abstracts, author keywords, keywords created)
Terms used in search fields	Brazil OR South Atlantic AND cetacea* OR dolphin* OR whale* OR odontocet* OR mysticet* OR toothed whale* AND anthropogenic impact* OR human impact* OR human effect* OR disturbance* OR threat* OR pressure on marine ecosystem* OR habitat loss* OR habitat degradation* OR marine scrap* OR marine rubbish* OR marine trash* OR marine garbage* OR marine rubble* OR pollution by plastic* OR ingestion OR floating solid waste debris* OR bridge construction* OR oil exploration* OR natural gas exploration* OR mining exploration* OR overfishing* OR depletion of fish stock* OR resource competition* OR incidental capture* OR incidental catch* OR accidental capture* OR accidental catch* OR capture in fishing net* OR capture in gillnet* OR capture in trawl net* OR intentional capture* OR hunt* OR slaughter* OR killing by competition* OR intensification of maritime

	traffic* OR traffic of vessel* OR transit of vessel* OR boat* OR ship* OR collision with vessel* OR ships collision* OR noise pollution* OR noise of anthropogenic origin* OR seismic prospect* OR dredging* OR perforation* OR chemical pollution* OR contaminant* OR toxic waste* OR oil* OR oil spill* OR micro pollutant* OR uncontrolled OR observation tourism* OR whale watching*

2.2. Compilation of studies

We found 1,047 articles in these two databases during the initial search. Among these, we selectively chose articles published in peer-reviewed journals concerning studies conducted in Brazil and those that dealt with anthropogenic impacts on one or more species, thereby resulting in 103 publications (Appendix A). We excluded gray literature (i.e., dissertations, theses, and unpublished reports) to ensure greater data credibility. The criteria and details for inclusion and exclusion of articles were documented based on the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) [23] (Figure 1).

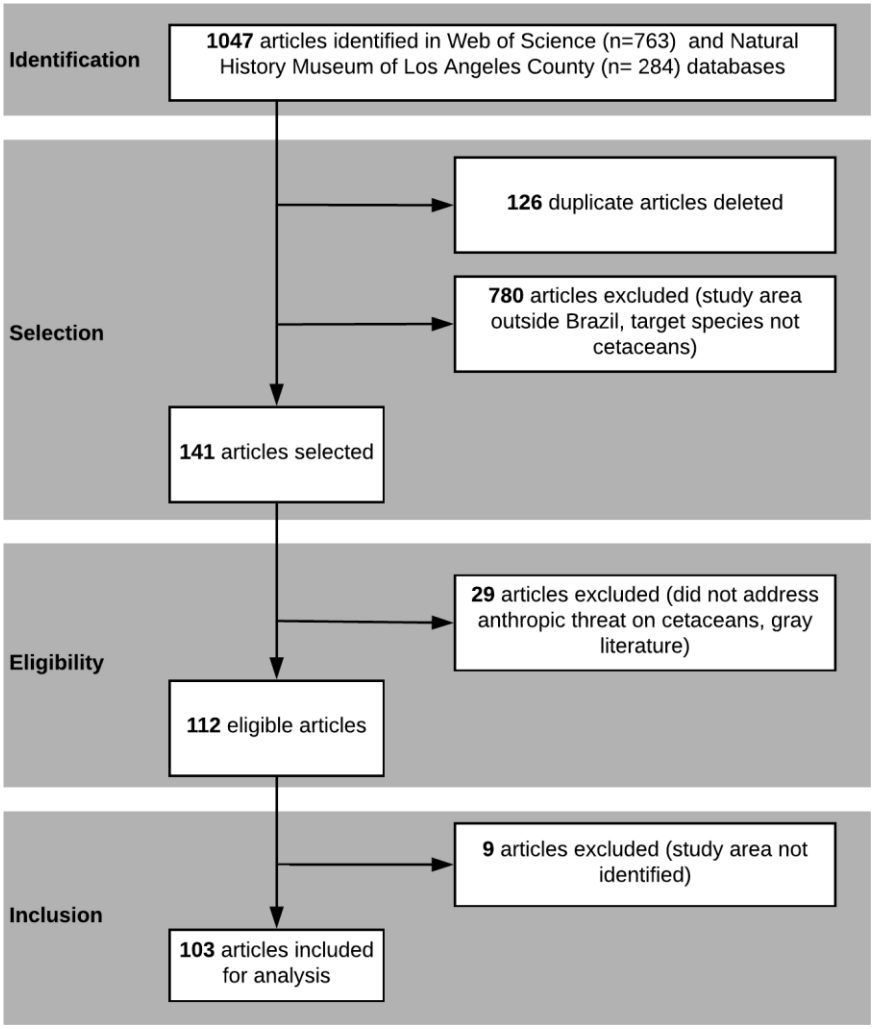

Fig. 1. Flowchart of all phases of the systematic review according to PRISMA guidelines (left) and the respective exclusion criteria (right).

The following data were extracted from each publication: 1) authors (as recommended by Salinero and Michalski (2016) [24]); 2) respective affiliations, including name of the institution, type (i.e., NGO, university or research institute), geographic location and coordinates of the institution; 3) target species, including name, family and suborder; 4) category of threat (vessel traffic, vessel collision, bycatch, hunting, pollution, dam construction, depletion of fish stock or several); and 5) study areas, including geographical locations and coordinates. The authors of each publication were categorized according to the institutions with which they were affiliated. The locations of the institutions were obtained from the institutional website or through Google Earth Pro 7.3.2 [25].

When the data collection for a study (i.e., publication) was carried out in more than one location or across extensive areas of a specific Brazilian state, we considered the central geographic coordinates of these locations. When the data collection for a study included more than one Brazilian state, we considered one central geographical point per state. When there were no geographic coordinates reported, we searched for the closest coordinates using Google Earth images, supported by maps and landmarks mentioned in the publication, such as municipalities, rivers or estuaries. We obtained Geographic coordinates for mapping the distribution of the studies from Google Earth Pro 7.3.2 [25] and georeferenced on the QGIS 2.18.7 platform [26].

2.3. Data analysis

Graphical images of the scientific collaboration networks between the institutions associated with the 103 publications were analyzed using the methodology developed by Salinero and Michalski (2016) [24] and the Igraph package [27] in R [28]. Within this network, each node represents an institution. The interactions between the institutions were based on a combination of the number of intermediate nodes and binding weights. In this study, we used two measures of the centrality of nodes to calculate the degree of influence of each institution, namely the degree of centrality (degree) and the centrality of intermediation (betweenness). The degree refers to the number of adjacencies for each node in a network, in other words, the number of nodes to which the focal node is connected. The higher the degree, the larger the area of the circle depicted in the graphs. Betweenness is the measure of influence that a node has on the propagation of information flow through the network. The greater the value of betweenness, the more centralized the circle is on the graph [29]. Therefore, in our study, the degree represents the number of times an institution had direct contact with the others, and betweenness represents the communication potential of an institution to act as a bridge of information.

3. Results

The 103 scientific papers that met the inclusion criteria (i.e., dealing with human impacts on cetaceans in Brazil) were published from 1996 to 2016. No publications that met these inclusion criteria were found between 1986 and 1995.

Almost half (47.6%) of the publications on threats posed by humans to cetaceans in Brazil (n = 49) were published between 2011 and 2016. The highest number of

publications that were published in a single year (2012) was 13, while no publications were found between 1999 and 2001 (Figure 2).

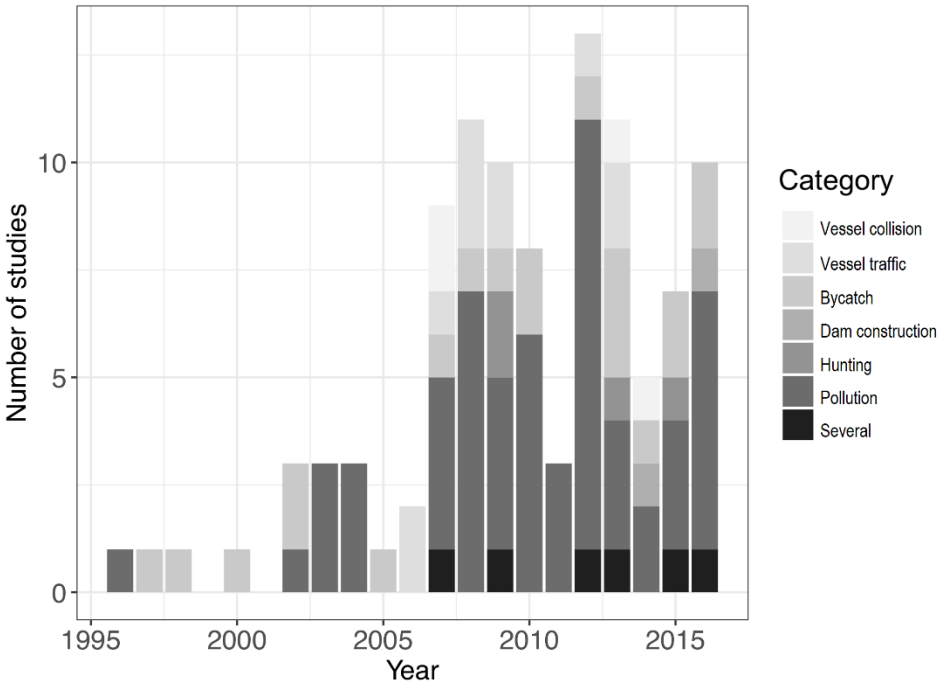

Fig. 2. Annual number of publications on human threats to cetaceans in Brazil, published between 1996 and 2016 (n = 103) separated by category of threat. The gray scale represents different research categories.

3.1. Institutions involved

In total, 257 authors were involved in these publications (mean ± SD = 5.9 ± 3.6, range = 1-16 authors). We identified 82 affiliations linked to these authors. The number of institutions per publication ranged from one to 11, with a median of three institutions per publication (mean = 3.2 ± 2). These institutions were distributed in 12 different countries; 55 institutions were national (Brazilian), and 27 were international (Figure 3 and Appendix B).

Overall, 35% (n = 36) of the 103 publications were (co-)authored by at least one author from an international institution. Most of the institutions were universities (n = 55), followed by NGOs (n = 15), and research institutes (n = 12).

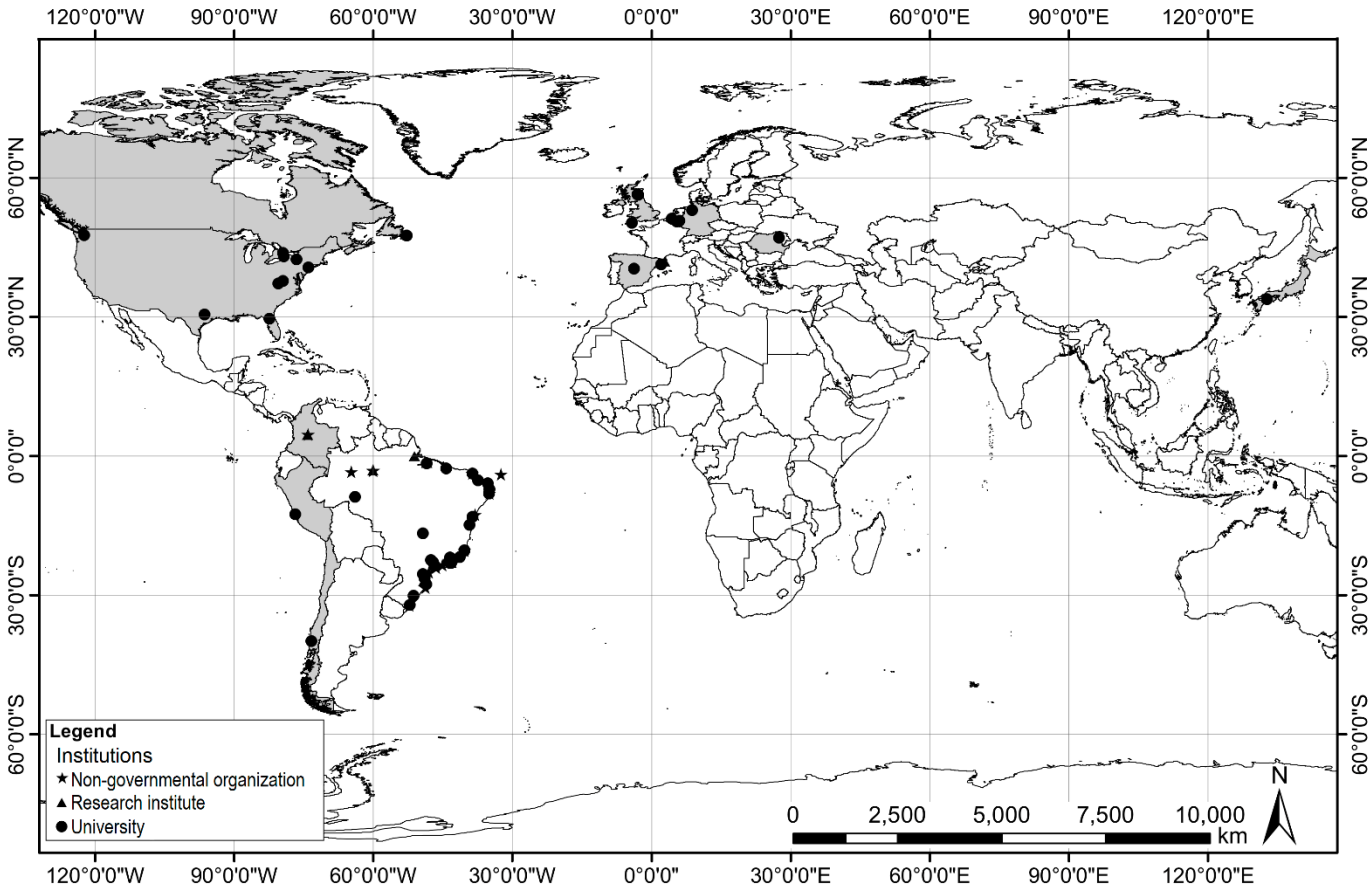

Fig. 3. Geographic distribution of national (n = 55) and international (n = 27) institutions involved in 103 researches on human threats to cetaceans in Brazil. Institution types are represented by different symbols.

3.2. Scientific collaboration networks

Six institutions contributed most to this scientific collaboration network in terms of research regarding anthropogenic threats to cetaceans in Brazil (i.e., they had a large number of partnerships and publications) (number of publications = 66; 64.1%). Among these institutions, there were five universities, namely the Federal University of Rio de Janeiro (UFRJ) (degree: 41; betweenness: 657.95), the State University of Rio de Janeiro (UERJ) (degree: 39; betweenness: 540.40), the Federal University of Rio Grande (FURG) (degree: 31; betweenness: 427.47), the State University of Norte Fluminense Darcy Ribeiro (UENF) (degree: 28; betweenness: 448.65), the University of São Paulo (USP) (degree: 21; betweenness: 219.85), and one NGO, the BioPesca Project (BioPesca) (degree: 25; betweenness: 130.15) (Figure 4 and Appendices C and D).

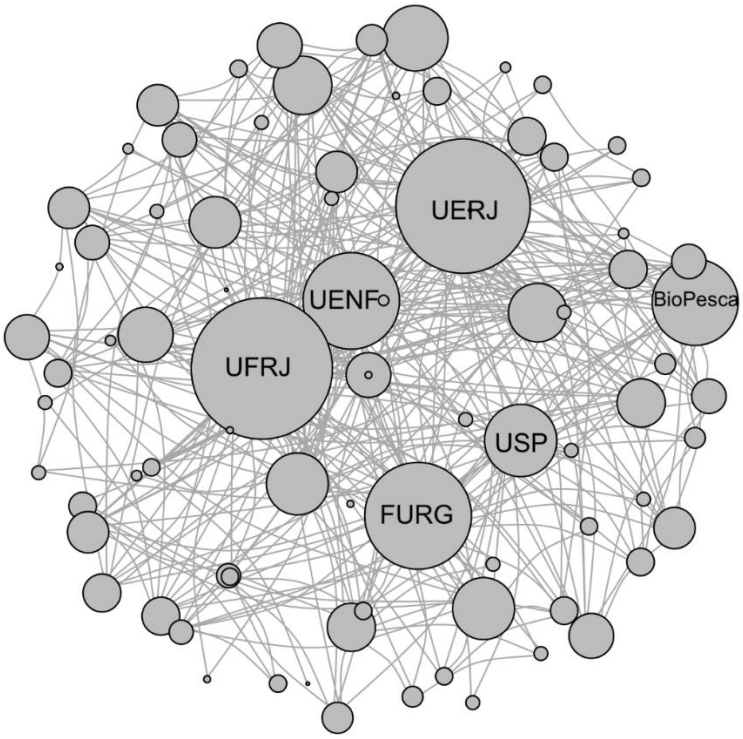

Fig. 4. Networks of scientific collaboration in researches on human threats to cetaceans in Brazil based on 103 publications. Each circle represents an institution (n = 82) and the connection link the institutions that collaborate. The area of the circles is proportional to the degree of centrality of the institution. The acronyms of the six institutions that contribute most to the network are shown, namely: UENF - Universidade Estadual do Norte Fluminense Darcy Ribeiro; UERJ - Universidade do Estado do Rio de Janeiro; UFRJ - Universidade Federal do Rio de Janeiro; FURG - Universidade Federal do Rio Grande; USP - Universidade de São Paulo and, BioPesca - Projeto BioPesca.

3.3. Target species and categories of threat

Most publications (89.3%; n = 92) focused on one or more odontocete species, while only 8.7% (n = 9) of the publications focused on one or more mysticete species; and only 1.9% (n = 2) studied both on mysticetes and odontocetes (Table 2). The first publication regarding threats posed by humans related to mysticetes in Brazil was published in 2006, but most publications in subsequent years considered odontocetes (Figure 5).

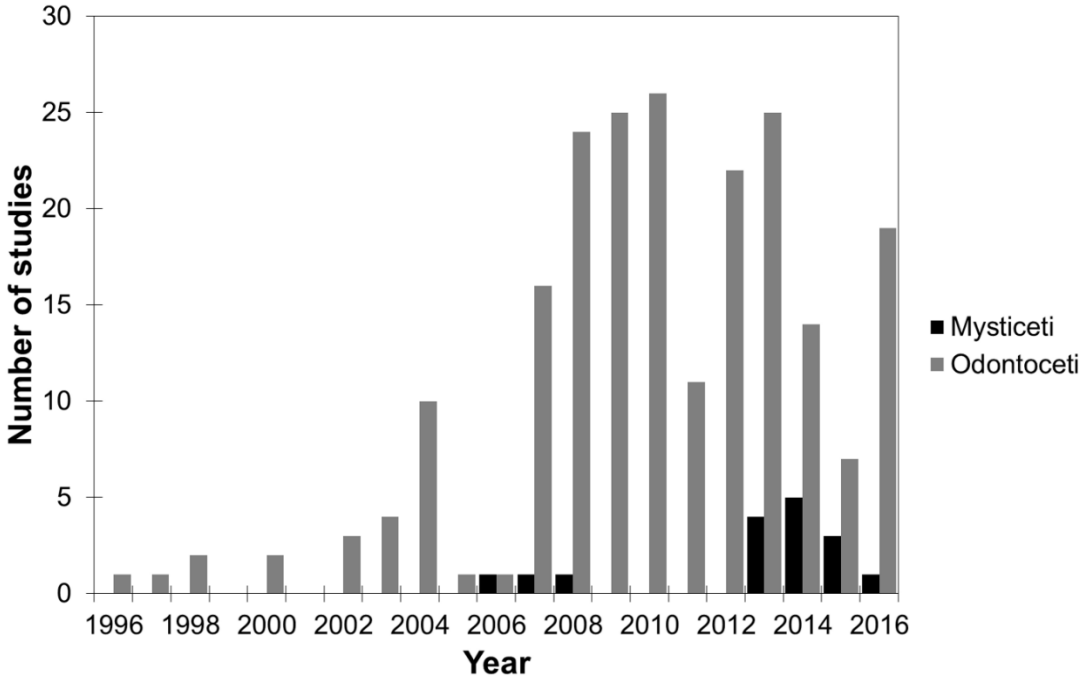

Fig. 5. Annual number of studies on human threats to cetaceans in Brazil published between 1996 and 2016, separated by cetaceans groups of the target species. As each publication could target more than one species, the total number presented here is 228. Gray and black bars represent publications on odontocetes and mysticetes species, respectively.

The compiled studies covered 28 of the 48 species of cetaceans present in Brazil, namely one (N=1) Balaenidae, three (N=3) Balaenopteridae, and 24 odontocetes, including the families Delphinidae, Iniidae, Kogiidae and Pontoporiidae (Table 2). The number of species investigated per publication ranged from one to 15 [30]. Thirty-five publications investigated more than one target species. The most comprehensively studied odontocete species was the Guiana dolphin (*Sotalia guianensis*), which was included in 50 publications, followed by the Franciscana (*P. blainvillei*) included in 38 publications, the bottlenose dolphin (*Tursiops truncatus*) included in 17 publications, and the Atlantic spotted dolphin (*Stenella frontalis*) included in 16 publications. The most comprehensively studied mysticete species were the humpback whale (*Megaptera novaeangliae*) included in six (N=6) publications, and the southern right whale (*Eubalaena australis*) included in five (N=5) publications. These numbers add up to 121 publications, which is larger than the 103 scientific papers investigated because some publications included more than one species.

The publications were classified into seven different categories of anthropogenic threats, with more than half (54.4%) of these articles focused on pollution (n = 56),

followed by bycatch (n = 20; 19.4%), vessel traffic (n = 11; 10.7%), several (n = 6; 5.8%), vessel collision (n = 4; 3.9%), hunting (n = 4; 3.9%), and dam construction (n = 2; 1.9%) (Appendix A). No studies were found on the category depletion of fish stock.

Table 2. List of 48 cetacean species that occur in Brazilian jurisdictional waters. Twenty-eight species were target of studies on human threats to cetaceans in Brazil, published between 1986 and 2016. The number of institutions involved on these studies, the threat categories in the ICMBio Brazilian list (Brazilian List) and in the World Conservation Union list (IUCN Red List) is informed for each species. Threat categories: CR - Critically endangered; DD - Data deficient; EN - Endangered; LC - Least concern; NT - Near threatened and VU - Vulnerable. Symbols: * - Species is included in State lists of endangered species (Bahia and Paraná); ** - Species occurring in Brazilian waters, but not included in the Brazilian national list.

Taxon	Common name	Number of institutes	Brazilian List	IUCN Red List
Suborder Mysticeti				
Family Balaenidae				
Eubalaena australis	Southern right whale	12	EN	LC
Family Balaenopteridae				
Balaenoptera acutorostrata	Minke whale	6	DD	LC
Balaenoptera bonaerensis	Antarctic minke whale	0	DD	NT
Balaenoptera borealis	Sei whale	0	VU	EN
Balaenoptera edeni	Bryde's whale	3	DD	DD
Balaenoptera musculus	Blue whale	0	CR	EN
Balaenoptera physalus	Fin whale	0	EN	VU
Megaptera novaeangliae	Humpback whale	14	VU	LC
Suborder Odontoceti				
Family Delphinidae				
Cephalorhynchus commersonii	Commerson's dolphin	0	**	LC
Delphinus capensis	Long-beaked common dolphin	9	DD	DD
Delphinus delphis	Short-beaked common dolphin	14	DD	LC
Delphinus sp.	*Delphinus* sp.	6	DD	DD
Feresa attenuata	Pygmy killer whale	9	DD	DD
Globicephala macrorhynchus	Short-finned pilot whale	0	DD	DD

Globicephala melas	Long-finned pilot whale	7	DD	DD
Grampus griseus	Risso's dolphin	9	DD	LC
Lagenorhynchus australis	Peale's dolphin	0	**	DD
Lagenodelphis hosei	Fraser's dolphin	13	DD	LC
Lissodelphis peronii	Southern right whale dolphin	0	**	LC
Orcinus orca	Killer whale	11	DD	DD
Peponocephala electra	Melon-headed whale	7	DD	LC
Pseudorca crassidens	False killer whale	17	DD	DD
Sotalia fluviatilis	Tucuxi	10	**	LC
Sotalia guianensis	Guiana dolphin	61	VU*	NT
Stenella attenuata	Pantropical spotted dolphin	13	DD	LC
Stenella clymene	Clymene dolphin	4	DD	DD
Stenella coeruleoalba	Striped dolphin	21	DD	LC
Stenella frontalis	Atlantic spotted dolphin	33	DD	LC
Stenella longirostris	Spinner dolphin	22	DD	DD
Stenella sp.	*Stenella* sp.	1	DD	DD
Steno bredanensis	Rough-toothed dolphin	30	DD	LC
Tursiops truncatus	Common bottlenose dolphin	29	DD	LC
Family Iniidae				
Inia geoffrensis	Amazon river dolphin	24	**	VU
Family Hyperoodontidae				
Hyperoodon planifrons	Southern bottlenose whale	0	DD	LC
Family Kogiidae				
Kogia sima	Dwarf sperm whale	8	DD	DD
Kogia breviceps	Pygmy sperm whale	0	DD	DD
Family Physeteridae				
Physeter macrocephalus	Sperm whale	0	VU	VU
Family Phocoenidae				
Phocoena dioptrica	Spectacled porpoise	0	**	LC
Phocoena spinipinnis	Burmeister's porpoise	0	**	NT

Family Pontoporiidae				
Pontoporia blainvillei	Franciscana	40	EN	VU
Family Ziphiidae				
Berardius arnuxii	Arnoux's beaked whale	0	DD	DD
Mesoplodon europaeus	Gervais' beaked whale	0	DD	DD
Mesoplodon densirostris	Blainville's beaked whale	0	DD	DD
Mesoplodon grayi	Gray's beaked whales	0	DD	DD
Mesoplodon hectori	Hector's beaked whale	0	DD	DD
Mesoplodon layardii	Strap-toothed beaked whale	0	DD	DD
Mesoplodon mirus	True's beaked whale	0	**	DD
Ziphius cavirostris	Cuvier's beaked whale	0	DD	LC

3.4. Spatial distribution of studies

We referenced only one geographical point for 82 of the publications and more than one geographical point for 21 of the publications, when more than one state (min-max = 2 – 6) was investigated (Appendix A). From the publications with only one geographical point, we determined a central position between points of 19 of them (average distance between geographical points =144 km; min-max = 12 – 443 km). Overall, we identified 63 study areas (Figure 6 and Table 3).

Table 3. List of 63 study areas relating to 103 researches on human threats to cetaceans in Brazil with their names, Brazilian states, and geographical coordinates.

N	Name of study area	State	Latitude (degrees)	Longitude (degrees)
1	Amapá	AP	0°25'46.57"S	51°31'38.43"W
2	Aracaju	SE	10°58'15.67"S	37° 2'7.04" W
3	Arquipélago dos Abrolhos	BA	17°57'45.40"S	38°42'15.83" W
4	Baia de Guanabara	RJ	22°48'41.66"S	43° 9'16.07" W
5	Baia de Paranaguá	PR	25°27'50.57"S	48°22'57.84" W
6	Baia de Santos	SP	23°58'32.91"S	46°20'8.62" W
7	Baia de Sepetiba	RJ	22°58'15.43"S	43°43'9.26" W

8	Baia de todos os Santos	BA	12°50'36.42"S	38°31'28.95" W
9	Baia Norte	SC	27°34'23.50"S	48°32'3.06" W
10	Barra de São João	RJ	22°35'48.92"S	41°59'23.16" W
11	Barra do Furado	RJ	22°12'25.73"S	41°28'22.67"W
12	Barra do Riacho	ES	19°49'22.69"S	40°16'47.54"W
13	Cabo Frio	RJ	22°53'12.32"S	42° 1'34.54"W
14	Caburé	MA	2°34'53.56"S	42°41'31.53"W
15	Cananéia	SP	25° 1'14.59"S	47°55'55.09"W
16	Costa ES	ES	19°49'31.67"S	40° 2'9.48"W
17	Costa PB	PB	7° 8'3.38"S	34°49'21.13"W
18	Costa PE	PE	8°23'49.84"S	34°57'48.33"W
19	Costa PR	PR	25°48'59.88"S	48°32'1.18"W
20	Costa RJ	RJ	31°35'6.08"S	51°17'2.31"W
21	Costa RN	RN	5° 7.267'S	35° 38.154'W
22	Costa RS	RS	31°35'6.08"S	51°17'2.31"W
23	Costa SC	SC	27° 20.493'S	48° 31.816'W
24	Costa SP	SP	23°58'50.96"S	46°13'39.52"W
25	ETA Guandu	RJ	22°50'22.13"S	43°36'36.70"W
26	Fernando de Noronha	PE	3°51'0.02"S	32°25'0.00"W
27	Fortaleza	CE	3°43'4.15"S	38°31'12.87"W
28	Garopaba	SC	28° 1'24.27"S	48°37'2.99"W
29	Ilha Comprida	SP	24°48'36.55"S	47°38'43.11"W
30	Ilha do Cardoso	SP	25° 9'34.75"S	47°55'2.60"W
31	Itacaré	BA	14°16'40.52"S	38°59'38.81"W
32	Itanhaém	SP	24°10'54.49"S	46°47'6.14"W
33	Lagoa dos Patos	RS	31° 5'59.92"S	51°15'2.05"W
34	Macaé	RJ	22°23'8.51"S	41°47'4.19"W
35	Manacapuru	AM	3°17'23.02"S	60°37'54.87"W
36	Novo Airão	AM	2°37'0.01"S	60°56'0.00"W
37	Pontal do Sul	PR	25°33'28.77"S	48°21'51.12"W
38	Porto do Malhado	BA	14°46'8.02"S	39° 1'33.03"W
39	Porto São Sebastião	SP	23°48'12.57"S	45°23'10.52"W
40	Prado	BA	17°20'24.58"S	39°13'1.33"W

41	Praia Canoa Quebrada	CE	4°31'28.35"S	37°42'5.61"W
42	Praia da Piedade	PE	8° 8'55.50"S	34°54'24.24"W
43	Praia da Pipa	RN	6°13'21.18"S	35° 4'15.93"W
44	Praia da Ribanceira	BA	28° 11.438'S	48° 39.743'W
45	Praia do J F. do Quissamã	RJ	22°12'25.73"S	41°28'22.67"W
46	Praia Grande	SP	24° 0'51.79"S	46°24'44.37"W
47	Recreio dos Bandeirantes	RJ	23° 1'30.99"S	43°27'17.08"W
48	Reserva Mamirauá	AM	3°35'0.01"S	64°45'0.03"W
49	Rio Amazonas	AM	3° 8'8.96"S	60° 1'51.34"W
50	Rio Araguaia	AM	11°41'58.35"S	50°41'32.34"W
51	Rio Grande	RS	32°14'57.48"S	52°13'55.01"W
52	Rio Japurá	AM	2°43'13.22"S	64°53'46.64"W
53	Rio Paraíba	PB	7°19'16.36"S	35°29'50.17"W
54	Rio Paraíba do SuL	SP	21°45'19.83"S	41°19'6.14"W
55	Rio São Francisco	AL	9° 56.716'S	36° 1.356'W
56	Rio Tapajós, Itaituba	PA	4°16'59.31"S	55°59'32.07"W
57	S. F.de Itabapoana	RJ	21°18'19.39"S	40°57'35.77"W
58	Saco da Ribeira, Ubatuba	SP	23°30'11.18"S	45° 7'35.42" W
59	São Paulo (estuário)	SP	23°55'26.42"S	46°18'27.46" W
60	Saquarema	SP	22°55'12.02"S	42°30'37.00" W
61	Tibau do Sul	RN	6°11'15.48"S	35° 5'43.11" W
62	Urani	AM	2°58'56.08"S	65° 9'33.72" W
63	Vila Velha	ES	20°20'48.48"S	40°17'41.23" W

The spatial distribution of these studies indicates that they cover large areas of Brazilian coastal waters, with the exception of one Brazilian coastal state (Piauí state) and some riverine areas. These publications were concentrated in the state of Rio de Janeiro (n = 33; 22.4%), followed by the states of São Paulo (n = 29; 19.7%), Rio Grande do Sul (n = 19; 12.9%), Amazonas (n = 11; 7.5%), Bahia (n = 9; 6.1%), Ceará (n = 9; 6.1%), and Paraná (n = 9; 6.1%). The Brazilian states of Alagoas, Amapá, Maranhão, and Sergipe were only represented by one publication each.

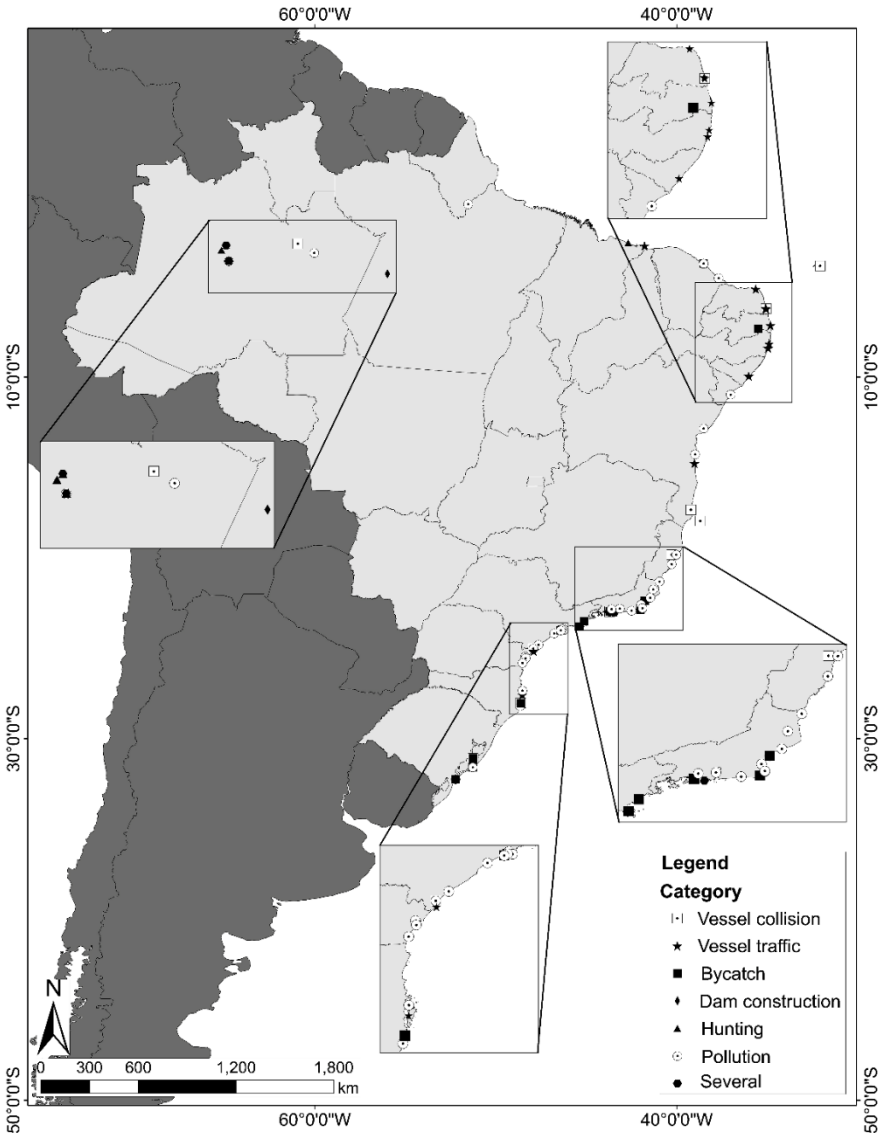

Fig. 6. Geographic distribution maps of the study areas of 103 publications on human threats to cetaceans in Brazil. Coverage of Brazilian publications, the square presents the region with the highest concentration of publications; each symbol represents the category of threat addressed.

4. Discussion

Financial resources from federal and state sources for research in Brazil were abundant between 2007 and 2014 [31], which may explain the increase in the number of publications from 2007 compared to previous years. However, an economic crisis that began in 2014 in Brazil resulted in a progressive decrease in funding for research from almost all funding agencies [32]. Therefore, a reduction in the number of studies conducted on Mysticetes in the subsequent years, (see 2015 and 2016, Figure 5), may be attributed to the decrease in funding for research as those require expensive resources.

These studies involve detailed logistical planning, higher equipment costs, and a specialized team since most mysticetes are found further from the coast than many odontocetes.

Scientific studies conducted on Mysticetes, such as those on humpback whales, began only in the late 1980s in Brazil [33]. A few decades ago, information regarding the distribution of mysticetes in Brazil was obtained from data collected on animals stranded along with the coast, occasional observation efforts, or reports from the time when commercial whaling was permitted [34].

The investments in the internationalization of higher education in Brazil started in 1998 [35], a factor that may have contributed to the increase in the number of publications. We found that almost one-third of the compiled publications had some international contribution. Leimu and Koricheva (2005) [36] showed that the involvement of two or more institutions in the development of ecological studies favors productivity, quality and impact in scientific publications. Also, several authors have shown that research involving international institutions is cited more often when compared to research involving collaborators from the same country since international collaborations provide greater visibility in the scientific community [20, 37]. Although our study was not intended to evaluate correlations between the number of institutions, internationalization and the impact of publications we recommend, when possible, broad network collaboration, including international participation of co-authors for future research.

According to a preliminary survey (Marega-Imamura, unpublished data), there are 21 Brazilian NGOs involved with cetacean conservation and they have an important role in Brazilian research. In fact, a Brazilian NGO (i.e. BioPesca Project) was ranked as one of the tops sixthly institutions from our compiled publications that contributed most to the scientific collaboration network. NGOs focused on environmental conservation have played an important participatory role in the management of biodiversity preservation, recovery and research. In addition, the involvement of this type of institution in research favors the dissemination of research, increases social pressure against harmful activities and stimulates environmental awareness in society [38].

The six institutions (UFRJ, UERJ, FURG, UENF, USP, and BioPesca) which contributed with more publications and had higher network collaboration can be justified by financial and temporal reasons. All these institutions are located in the southern and south of Brazil, a region that historically receives more federal investments in research

[39, 40]. Besides, UFRJ and USP are between the oldest Brazilian Universities, founded in 1920 and 1934, respectively [41, 42]. Furthermore, FURG and UERJ established the first Brazilian oceanography courses. The supply of financial resources and the long time of the establishment of research groups in the south of Brazil may have favored a bigger scientific production and research networking. The locations of these institutions are of main importance as it corresponds to locations of diversity hotspots for cetaceans (i.e. subtropical waters of southeastern and southern Brazil, see [43]).

A total of 48 cetacean species are found in Brazilian jurisdictional waters (see [21]). Only 28 species, however, were investigated by the publications discussed here. That means that the effects of threats on the other 20 species occurring in Brazil [44] have not been published in articles that meet the criteria of our analysis (Table 2). A potential reason for the non-existence or inadequacy of studies carried out on several species of cetaceans in Brazil is methodological challenges. Many species swim at high speeds, travel long distances daily, or migrate seasonally over thousands of miles. These behaviors make it difficult to obtain basic information and determine factors that may be impacting these populations. For example, the smaller number of publications on mysticetes compared to odontocetes might be directly related to the higher cost of studying mysticetes. Nonetheless, there is a need to intensify research efforts to increase our knowledge of and understand the conservation needs of mysticetes in Brazil.

More than half of the publications from our compilation focused on pollution as an anthropogenic threat to cetaceans. According to Schipper et al. (2008) [45], pollution is the second major threat to marine mammals. Although pollution research involves high costs for laboratory analyses, cetacean carcasses are often available and tissue collection can be easily done on-site. Several publications described strandings in Brazilian coastal, commonly involving more than one species and requiring various expertise and equipment to analyses data on chemical pollution, consequently involving large collaboration networks [46-48].

There was only one published article addressing the consequences of marine debris ingestion [49]. Unlike chemical pollution analyses, which require few tissue samples of cetacean carcasses, the sampling of debris data demands exhausting access and collection of gastrointestinal tracts and depends on the carcass level of decomposition. Although the available evidence suggests events of debris ingestion and high death rates, there is a substantial knowledge gap regarding the impact of this threat

[50]. Debris in the oceans continues to grow; therefore, collection and publication on the interaction of cetaceans with the debris are strongly recommended [51].

We found two publications addressing the consequences of noise pollution, one of them dealing with seismic [52]. Therefore, there is a need to access more related data as seismic activities, which are associated with a significant impact on cetaceans [53].

We found bycatch as the second most studied anthropogenic threat. Bycatch in fishing nets is another serious threat to marine mammals, affecting 78% of species [45], and is also the main cause of death in cetaceans [54-56]. Odontocetes that are found in coastal and estuarine distributions, such as the Guiana dolphin and the Franciscana, are threatened by a greater variety of human activities (habitat loss, pollution and vessel traffic) and are most vulnerable to fishing gear in Brazil [56]. Despite the high impact rate of fishing activity on cetacean populations, this was not the predominant category of threats among the evaluated published studies.

Dolphins that inhabit fluvial environments are considered the most threatened cetaceans because they inhabit areas of high human occupation. Conflicts and anthropogenic pressure on natural resources are more intense [57]. Four of the publications identified here regarding hunting focused on Piracatinga bait. The use of Amazon River dolphin as bait for the Piracatinga fishery in the Amazon region has been observed in recent years, leading to several studies [58-61] for the establishment of public conservation policies, such as a moratorium on Piracatinga fishing for five years (i.e. since January of 2015 until January of 2020 [62]).

The Amazon is among 20 key conservation sites for marine mammal diversity [1]. Despite the high threat to river species, our analysis indicated that studies on the Amazon River dolphin are only the fifth most conducted studies. A greater effort to conduct studies, especially on river dolphins, is needed to better assess the impact of potential threats and to design effective measures for conservation [63].

As discussed at the Society Latin American of Specialists in Aquatic Mammals Meeting (XII SOLAMAC - Peru, November 2018) there is a lacking data on bycatch. As long as there is a lack of legislation in Brazil to monitoring onboard for assesses the impacts of bycatch, Brazil is one of the worst-performing Latin American countries in terms of monitoring artisanal and industrial fishery activities.

The incidence and degree of human impacts vary considerably among populations and species of cetaceans [64], and it poses a greater threat to populations that are already vulnerable. Endemic and restricted species are prioritized for conservation, as they are

generally more vulnerable to anthropogenic impacts [65, 66]. Some of the species that were more frequently studied are listed as threatened in Brazil [44]: the Guiana dolphin and the humpback whale, which are categorized as vulnerable, and the Franciscana and Southern right whale , which are categorized as endangered.

Interactions between cetaceans and vessels have increased since the 1990s due to accelerated growth in human activities in coastal regions [57]. In Brazil, publications related to this category of threat were observed only after 2006. An increase in the interest in whale watching highlights the need for studies on the possible impacts of vessel traffic during whale watching [67]. The interest in this activity doubled worldwide between 1991 and 1998, and by the year 2006 it was increasing at an average annual rate of 11.3% [68]. Whale watching is currently carried out in at least 119 countries worldwide [69].

Several of these threats are complex and interrelated processes that may interact synergistically, occur simultaneously, or be a consequence of another threat [21]. For example, we classified a given publication in the vessel traffic category if it addressed behavioral changes in cetaceans at the individual or group level concerning a vessel traffic situation. However, vessel traffic can also lead to other threats as noise pollution, chemical pollution, collisions or release of marine debris. Some categories of threat require further investigation. Although seismic activity significantly impacts cetaceans [53], we found only one published article dealing with this category of threat [52]. No studies were found concerning the depletion of fish stock.

It is noteworthy that other impacts related to human activities, such as climate change, have not been addressed in this study but are also of critical importance [70-72]. Although deforestation of riparian forests and the cascading implications for cetacean species, the introduction of exotic species and swimming with cetaceans are also threats of concern, we did not included in our analyses, because they were not highlighted or discussed in detail in the four books that we used as references [6, 18, 19, 21] while defining categories of anthropogenic threats to cetaceans.

Very few study areas were found along the coast of Bahia state, even though this state has the longest coastline. Similarly, the state of Maranhão presented only one study site despite having the second-longest stretch of coastline. The largest numbers of study areas were identified in Rio de Janeiro, even though it is the Brazilian state with the third-longest stretch of coastline. The concentration of both institutions and areas of study in certain regions of Brazil may be related to the availability of financial resources, and consequently, the establishment of more research groups. This distribution of institutions

and areas of study may be limiting knowledge of human impacts on cetaceans in other Brazilian regions. The southeast region contains the largest number of institutions (Figure 3) of higher education and research, as well as a greater number of researchers. As highlighted by Salinero and Michalski 2016 [24], over half of the study sites with aquatic vertebrates in the Brazilian Amazon were located within 500 km of the research institute/university of the first and last authors of the study. Thus, there is a need to expand the spatial distribution of studies on marine mammals across other Brazilian states, minimizing the bias of centralization of studies in areas with a higher concentration of universities, research centers and researchers.

5. Conclusions

This study analyzes the main topic of published research from the last 31 years regarding human threats to cetaceans in Brazil, intending to point out gaps in studies focused on the conservation of cetaceans. Brazil is a country with large coastal territories, but, as pointed out here, the northern and northeastern regions have a knowledge gap regarding studies on the impacts of human activities on cetaceans with only 29% of the studies carried out in these regions. The coast of Bahia state is an important breeding ground for humpback whales [73] and other cetaceans occur in this region, thereby indicating that it is an area of great ecological importance concerning the conservation of cetacean species [74]. Thus, the region should be a priority for future studies and conservation efforts. We recognize and recommend the need to increase the number of studies on cetaceans along the coast of Bahia state.

Research on marine mammals has become a complex undertaking, such that each project requires a group of researchers with different knowledge (e.g., behavioral observations, statistical skills, and laboratory techniques, among others). Thus, more partnerships between different laboratories could yield more research projects and allow for high-quality research to be conducted [13]. Our results may help researchers define priorities that need to be addressed, identify partnerships for future research and identify species and regions in Brazil experiencing knowledge gaps. The scientific collaboration networks and partnerships among institutions involved, and those that have not yet been identified, should be broadened and strengthened. With these collaborative efforts and the exchange of information, studies on cetaceans in Brazil could lead to more effective conservation of these species.

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List of Appendices

Appendix A. List of 103 researches on human threats to cetaceans in Brazil published between 1996 and 2016 with the respective category of threat, information on the geographic coordinates of the study areas and target species.

Source	Central point	Reported coordinates	Name of study area	State	Category of threat	Target species
1	NO	NO	Costa RJ	RJ	pollution	*T. truncatus* *S. bredanensis* *S. guianensis* *P. blainvillei*
3	YES	YES	Praia Grande	SP	bycatch	*P. blainvillei*
5	NO	NO	Costa PR	PR	pollution	*S. guianensis*
5	NO	NO	Costa RJ	RJ		
5	NO	NO	Vila Velha	ES		
5	NO	NO	Fortaleza	CE		
6	NO	NO	Costa RJ	RJ	pollution	*P. blainvillei*
7	YES	YES	Ilha Comprida	SP	pollution	*S. frontalis*
8	NO	NO	Cananéia	SP	pollution	*S. guianensis*
9	YES	YES	Praia da Pipa	RN	vessel collision	*S. guianensis*
10	NO	NO	Rio Amazonas	AM	pollution	*I. geoffrensis*
11	YES	YES	Fortaleza	CE	pollution	*S. guianensis*
12	YES	YES	Rio Tapajós, Itaituba	AM	dam construction	*I. geoffrensis* *S. fluviatilis*
13	YES	YES	Praia da Ribanceira	BA	pollution	*E. australis*
14	NO	NO	Fortaleza	CE	bycatch	*S. guianensis* *S. bredanensis*
16	NO	NO	Rio Grande	RS	bycatch	*P. blainvillei*

17	YES	YES	Praia Grande	SP	bycatch	*P. blainvillei*
18	NO	NO	Costa PR	PR	pollution	*S. guianensis*
18	NO	NO	Costa SP	SP		*P. blainvillei*
						S. frontalis
						D. capensis
						S. coeruleoalba
21	YES	YES	Costa RS	RS	pollution	*P. blainvillei*
23	NO	NO	Costa SP	SP	pollution	*P. blainvillei*
						S. guianensis
						S. frontalis
						D. capensis
24	NO	NO	Baia de Santos	SP	bycatch	*O. orca*
25	NO	NO	Costa RS	RS	pollution	*P. blainvillei*
25	NO	NO	São Paulo (estuário)	SP		
28	NO	NO	Fortaleza	CE	pollution	*S. guianensis*
						L. hosei
						S. longirostris
						S. frontalis
						S. coeruleoalba
29	YES	YES	Recreio dos Bandeirantes	RJ	several	*E. australis*
30	YES	YES	Cabo Frio	RJ	bycatch	*O. orca*
						M. novaeangliae
						E. australis
						B. acutorostrata
						B. brydei
						P. blainvillei
						T. truncatus
						S. bredanensis
						S. frontalis
						Delphinus sp.
31	YES	YES	Rio Grande	RS	pollution	*P. blainvillei*
33	YES	YES	Fortaleza	CE	pollution	*S. bredanensis*
34	YES	YES	Baia Norte	SC	vessel traffic	*S. guianensis*
35	YES	YES	Costa RJ	RJ	pollution	*S. guianensis*
35	YES	YES	Costa SP	SP		*S. frontalis*
35	YES	YES	Costa PR	PR		*T. truncatus*
35	YES	YES	Costa SC	SC		*S. bredanensis*
						S. attenuata
						S. longirostris
						S. coeruleoalba
						D. capensis

						K. sima
40	NO	NO	Costa RJ	RJ	pollution	*S. guianensis*
41	NO	NO	Costa RJ	RJ	pollution	*P. blainvillei*
41	NO	NO	Costa SP	SP		
41	NO	NO	Costa PR	PR		
41	NO	NO	Costa RS	RS		
41	NO	NO	Costa SC	SC		
41	NO	NO	Costa ES	ES		
42	YES	YES	Fortaleza	CE	vessel traffic	*S. guianensis*
42	YES	YES	Costa RN	RN		
42	YES	YES	Rio São Francisco	AL		
42	YES	YES	Costa PE	PE		
42	YES	YES	Costa PB	PB		
43	NO	NO	Baia de Guanabara	RJ	pollution	*S. guianensis*
44	YES	YES	Costa RJ	RJ	pollution	*P. blainvillei* *S. guianensis*
45	YES	YES	Praia da Piedade	PE	vessel traffic	*S. guianensis*
46	YES	YES	Costa RS	RS	pollution	*P. blainvillei*
46	YES	YES	Costa RJ	RJ		
47	YES	YES	Caburé	MA	hunting	*L. hosei*
48	YES	YES	Arquipélago dos Abrolhos	BA	vessel traffic	*M. novaeangliae*
50	YES	YES	Costa RS	RS	bycatch	*T. truncatus*
52	NO	NO	Costa ES	ES	pollution	*P. blainvillei*
52	NO	NO	Costa SP	SP		
52	NO	NO	Costa RS	RS		
52	NO	NO	Costa SC	SC		
53	YES	YES	Arquipélago dos Abrolhos	BA	vessel traffic	*M. novaeangliae*
54	YES	YES	Fortaleza	CE	several	*S. guianensis* *S. frontalis* *P. crassidens* *T. truncatus* *S. bredanensis* *D. delphis* *S. attenuata* *S. longirostris* *S. coeruleoalba* *L. hosei*

						G. griseus
						K. sima
						P. blainvillei
						P. electra
						G. macrorhynchus
56	YES	YES	Macaé	RJ	bycatch	*S. guianensis*
57	NO	NO	Costa RJ	RJ	pollution	*O. orca*
						P. crassidens
						T. truncatus
						S. bredanensis
						D. capensis
						L. hosei
61	NO	NO	Macaé	RJ	pollution	*P. blainvillei*
						S. guianensis
62	YES	YES	Lagoa dos Patos	RS	bycatch	*T. truncatus*
63	NO	NO	Barra de São João	RJ	pollution	*S. guianensis*
67	NO	YES	Baia de Guanabara	RJ	pollution	*S. guianensis*
67	NO	NO	Costa ES	ES		*S. frontalis*
						P. crassidens
						T. truncatus
						S. bredanensis
						D. delphis
						S. attenuata
						S. longirostris
						S. coeruleoalba
						L. hosei
						G. griseus
						K. sima
						P. blainvillei
68	NO	NO	Costa RS	RS	pollution	*P. blainvillei*
70	NO	NO	Reserva Mamirauá	AM	pollution	*I. geoffrensis*
						S. fluviatilis
73	YES	YES	Praia da Pipa	RN	vessel traffic	*S. guianensis*
74	YES	YES	Costa RS	RS	pollution	*P. blainvillei*
74	YES	YES	Costa RJ	RJ		*P. blainvillei*
76	NO	NO	Saquarema	SP	pollution	*S. guianensis*
						S. frontalis
						P. crassidens
						T. truncatus

						S. bredanensis
						D. delphis
						S. attenuata
						S. longirostris
						S. coeruleoalba
						L. hosei
77	NO	NO	Saco da Ribeira, Ubatuba	SP	bycatch	*S. frontalis*
						S. longirostris
						P. electra
						F. attenuata
						T. truncatus
78	YES	YES	Cananéia	SP	pollution	*S. guianensis*
78	YES	YES	Baia de Paranaguá	PR		
80	NO	NO	Baia de Sepetiba	RJ	pollution	*S. guianensis*
81	NO	NO	Rio Japurá	AM	hunting	*I. geoffrensis*
						S. fluviatilis
82	YES	YES	Ilha do Cardoso	SP	vessel traffic	*S. guianensis*
83	NO	NO	Baia de todos os Santos	BA	pollution	*S. guianensis*
						S. clymene
84	YES	YES	Praia do J F. do Quissamã	RJ	pollution	*S. guianensis*
85	NO	NO	Itanhaém	SP	pollution	*P. blainvillei*
						S. frontalis
						S. guianensis
						T. truncatus
						S. bredanensis
86	NO	NO	Costa SP	SP	pollution	*S. frontalis*
						S. bredanensis
						S. guianensis
						T. truncatus
						P. blainvillei
						S. clymene
						Delphinus sp.
						D. delphis
						S. coeruleoalba
87	NO	NO	Amapá	AP	pollution	*S. guianensis*
88	YES	YES	Baia de Santos	SP	pollution	*S. frontalis*

88	YES	YES	Baia de Paranaguá	PR		
88	YES	YES	Costa SC	SC		
89	YES	YES	Baia de Sepetiba	RJ	bycatch	*S. guianensis*
90	NO	NO	Rio Paraíba do SuL	SP	pollution	*I. geoffrensis*
90	NO	NO	ETA Guandu	RJ		
91	NO	NO	Macaé	RJ	pollution	*P. blainvillei*
						S. guianensis
92	NO	NO	Costa RJ	RJ	pollution	*S. guianensis*
93	YES	YES	Tibau do Sul	RN	vessel traffic	*S. guianensis*
94	YES	YES	Rio Grande	RS	pollution	*P. blainvillei*
96	YES	YES	Rio Grande	RS	bycatch	*P. blainvillei*
98	YES	YES	Pontal do Sul	PR	pollution	*P. blainvillei*
98	YES	YES	Praia Grande	SP		
100	NO	NO	Reserva Mamirauá	AM	hunting	*I. geoffrensis*
101	YES	YES	S. F.de Itabapoana	RJ	pollution	*S. guianensis*
102	NO	NO	Costa SP	SP	pollution	*P. blainvillei*
102	NO	NO	Costa RS	RS		
103	NO	NO	Costa RJ	RJ	pollution	*P. blainvillei*
103	NO	NO	Costa SP	SP		
103	NO	NO	Costa PR	PR		
103	NO	NO	Costa RS	RS		
103	NO	NO	Costa SC	SC		
103	NO	NO	Costa ES	ES		
104	YES	YES	Fernando de Noronha	PE	vessel collision	*S. longirostris*
105	NO	NO	Praia da Pipa	RN	vessel traffic	*S. guianensis*
106	YES	NO	Baia de Santos	SP	pollution	*S. guianensis*
106	YES	NO	Praia Grande	SP		
108	YES	YES	Porto do Malhado	BA	vessel traffic	*S. guianensis*
						S. frontalis
						Stenella sp.
						S. bredanensis
109	YES	YES	Fortaleza	CE	pollution	*S. guianensis*
110	YES	YES	Garopaba	SC	bycatch	*E. australis*

111	YES	YES	Rio Grande	RS	bycatch	*P. blainvillei*
112	NO	NO	Manacapuru	AM	several	*I. geoffrensis* *S. fluviatilis*
113	NO	NO	Baia de Guanabara	RJ	pollution	*P. blainvillei* *S. guianensis*
115	YES	YES	Porto do Malhado	BA	vessel traffic	*S. guianensis*
116	YES	YES	Barra do Furado	RJ	bycatch	*P. blainvillei* *S. guianensis*
117	YES	YES	Praia do J F. do Quissamã	RJ	pollution	*F. attenuata* *O. orca* *P. blainvillei* *S. guianensis* *S. frontalis* *S. bredanensis* *T. truncatus*
120	NO	NO	Rio Japurá	AM	several	*I. geoffrensis* *S. fluviatilis*
121	YES	YES	Novo Airão	AM	vessel collision	*I. geoffrensis*
121	YES	YES	Prado	BA		*S. guianensis*
121	YES	YES	Barra do Riacho	ES		*T. truncatus*
121	YES	YES	Baia de Sepetiba	RJ		*E. australis*
121	YES	YES	Cananéia	SP		*M. novaeangliae*
121	YES	YES	Garopaba	SC		
121	YES	YES	Lagoa dos Patos	RS		
123	NO	NO	Costa SP	SP	pollution	*P. blainvillei* *S. guianensis* *S. bredanensis* *P. crassidens*
124	YES	YES	Porto São Sebastião	SP	bycatch	*B. acutorostrata*
125	YES	YES	Itacaré	BA	pollution	*M. novaeangliae*
125	YES	YES	Aracaju	SE		
126	YES	YES	Arquipélago dos Abrolhos	BA	vessel collision	*M. novaeangliae*

127	NO	NO	Rio Araguaia	AM	dam construction	*I. geoffrensis* *S. fluviatilis*
128	YES	YES	Praia do J F. do Quissamã	RJ	pollution	*P. blainvillei* *S. guianensis*
129	NO	NO	Reserva Mamirauá	AM	several	*I. geoffrensis*
130	YES	YES	Rio Paraíba	PB	bycatch	*G. griseus*
131	NO	NO	Urani	AM	hunting	*I. geoffrensis*
133	NO	NO	Praia do J F. do Quissamã	RJ	pollution	*S. guianensis* *S. bredanensis*
134	YES	YES	Pontal do Sul	PR	several	*S. guianensis* *P. blainvillei* *S. frontalis* *S. longirostris* *T. truncatus* *G. melas*
136	YES	YES	Porto São Sebastião	SP	bycatch	*B. acutorostrata*
138	YES	YES	Lagoa dos Patos	RS	bycatch	*T. truncatus*
139	NO	NO	Praia do J F. do Quissamã	RJ	pollution	*P. blainvillei*
140	NO	NO	Baia de Santos	SP	pollution	*P. blainvillei*
140	NO	NO	Baia de Sepetiba	RJ		*S. guianensis*
140	NO	NO	Praia Canoa Quebrada	CE		
141	YES	YES	Lagoa dos Patos	RS	bycatch	*T. truncatus*

Appendix B. List with full names, acronyms and geographic coordinates of the 82 institutions involved in conducting 103 publications on human threats to cetaceans in Brazil published between 1986 and 2016.

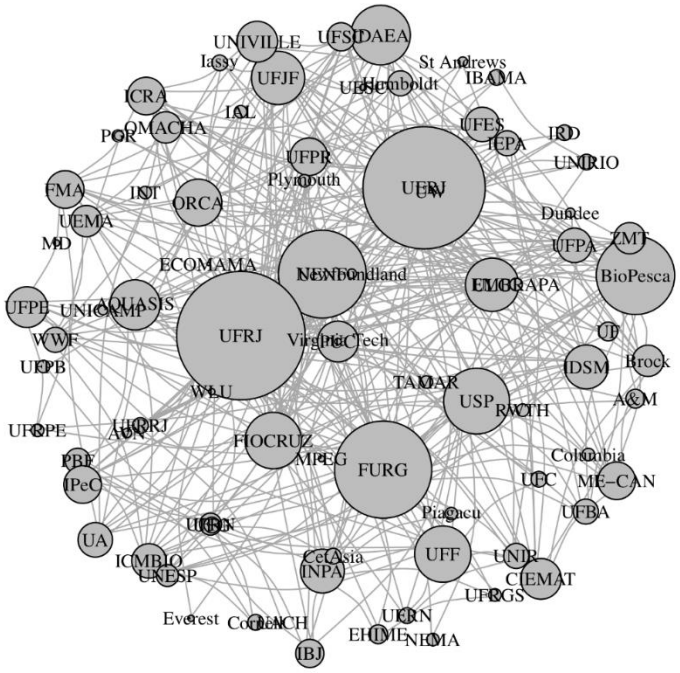
n	Type, country, Abbreviation	Institution	Latitude (degrees)	Longitude (degrees)
	Non-governmental organizations			

	Brazil:			
1	AVN	Associação Ambiental Voz da Natureza	20°18'52.03"S	40°18'10.79"O
2	AQUASIS	Associação de Pesquisa e Preservação de Ecossistemas Aquáticos	3°41'31.81"S	38°37'38.25"O
3	PGR	Centro Golfinho Rotador	3°50'54.40"S	32°25'37.70"O
4	FMA	Fundação Mamíferos Aquáticos	8° 1'45.68"S	34°54'26.37"O
5	IBJ	Instituto Baleia Jubarte	12°34'32.68"S	38° 0'28.02"O
6	IDSM	Instituto de Desenvolvimento Sustentável Mamirauá	3°21'19.05"S	64°43'52.15"O
7	IPeC	Instituto de Pesquisas Cananéia	25° 0'56.70"S	47°55'41.81"O
8	ORCA	Instituto ORCA	20°20'6.42"S	40°17'2.78"O
9	Piagaçu	Instituto Piagaçu	3° 5'42.08"S	59°59'27.51"O
10	NEMA	Núcleo de Educação e Monitoramento Ambiental	32°11'15.66"S	52° 9'28.48"O
11	PBF	Projeto Baleia Franca	28°19'53.24"S	48°42'37.00"O
12	BioPesca	Projeto BioPesca	24° 0'31.86"S	46°24'44.86"O
13	TAMAR	Projeto TAMAR	23°27'10.26"S	45° 4'13.79"O
14	WWF	World Wide Fund for Nature	3° 4'25.70"S	59°58'29.10"O
	Colombia:			
15	OMACHA	Fundación Omacha	4°40'20.11"N	74° 3'40.36"O
	Research institutes			
	Brazil:			
16	EMBRAPA	Empresa Brasileira de Pesquisa Agropecuária	22°58'16.32"S	43°13'24.91"O
17	Everest	Everest Tecnologia em Serviços Ltda	20°18'56.12"S	40°17'43.23"O
18	FIOCRUZ	Fundação Oswaldo Cruz	22°52'32.55"S	43°14'34.76"O
19	IAL	Instituto Adolfo Lutz	23°33'15.10"S	46°40'13.91"O
20	IBAMA	Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis	26°55'7.04"S	48°40'12.54"O
21	ICMBio	Instituto Chico Mendes de Conservação da Biodiversidade	26°57'41.93"S	49° 4'11.28"O
22	INPA	Instituto Nacional de Pesquisas da Amazonia	3° 6'35.74"S	60° 1'16.55"O
23	INT	Instituto Nacional de Tecnologia	22°53'46.31"S	43°11'3.43"O
24	MPEG	Museu Paraense Emílio Goeld	1°27'3.22"S	48°26'44.42"O
25	IEPA	Instituto de Pesquisa Científicas e Tecnológicas do Estado do Amapá	0° 1'44.37"N	51° 4'2.25"O
	Canada:			
26	ME-CAN	Ministry of Environment Canadá	43°41'10.59"N	79°24'3.66"O
	Colombia:			
27	Humboldt	Instituto de Investigación de Recursos Biológicos	4°36'59.80"N	74° 4'23.47"O
	Spain:			
28	ICRA	Catalan Institute for Water Research	41°58'2.29"N	2°50'26.34"L
	Universities			

	Belgium:			
29	ULG	Université de Liège	50°34'59.25"N	5°33'32.56"L
30	UA	University of Antwerp	51°13'22.11"N	4°24'36.83"L
	Brazil:			
31	CetAsia	CetAsia Research Group Ltd	43°48'17.03"N	79°25'22.06"O
32	ECOMAMA	Instituto de Estudos da Ecologia de Mamíferos Marinhos	22°54'27.93"S	43°11'1.88"O
33	IRD	Instituto de Radioproteção e Dosimetria	22°59'33.61"S	43°25'12.39"O
34	PUC	Pontifícia Universidade Católica	22°58'45.09"S	43°13'59.17"O
35	USP	Universidade de São Paulo	23°33'36.23"S	46°43'48.25"O
36	UERJ	Universidade do Estado do Rio de Janeiro	22°54'39.26"S	43°14'8.27"O
37	UERN	Universidade do Estado do Rio Grande do Norte	5°12'19.59"S	37°19'5.49"O
38	UNICAMP	Universidade Estadual de Campinas	22°49'5.33"S	47° 3'53.12"O
39	UESC	Universidade Estadual de Santa Cruz	14°47'50.03"S	39°10'16.63"O
40	UEMA	Universidade Estadual do Maranhão	2°34'34.11"S	44°12'31.46"O
41	UENF	Universidade Estadual do Norte Fluminense Darcy Ribeiro	21°45'48.13"S	41°17'30.22"O
42	UNESP	Universidade Estadual Paulista	22°23'43.10"S	47°32'42.72"O
43	UFBA	Universidade Federal da Bahia	12°59'57.56"S	38°30'26.66"O
44	UFPB	Universidade Federal da Paraíba	7° 8'18.10"S	34°50'41.15"O
45	UFG	Universidade Federal de Goiás	16°36'18.47"S	49°15'39.91"O
46	UFJF	Universidade Federal de Juiz de Fora	21°46'37.02"S	43°22'8.34"O
47	UFPE	Universidade Federal de Pernambuco	8° 3'6.55"S	34°57'1.17"O
48	UNIR	Universidade Federal de Rondônia	8°45'48.40"S	63°54'23.56"O
49	UFSC	Universidade Federal de Santa Catarina	27°36'1.37"S	48°31'10.45"O
50	UFC	Universidade Federal do Ceará	3°44'19.89"S	38°34'9.45"O
51	UFES	Universidade Federal do Espírito Santo	20°16'38.38"S	40°18'15.08"O
52	UNIRIO	Universidade Federal do Estado do Rio de Janeiro	22°57'6.67"S	43°10'27.91"O
53	UFPA	Universidade Federal do Pará	1°28'28.04"S	48°27'11.62"O
54	UFPR	Universidade Federal do Paraná	25°25'36.87"S	49°15'42.36"O
55	UFRJ	Universidade Federal do Rio de Janeiro	22°50'33.04"S	43°14'4.34"O
56	FURG	Universidade Federal do Rio Grande	32° 1'52.27"S	52° 6'6.63"O
57	UFRN	Universidade Federal do Rio Grande do Norte	5°50'5.52"S	35°12'41.05"O
58	UFRGS	Universidade Federal do Rio Grande do Sul	30° 2'1.85"S	51°13'6.84"O
59	UFF	Universidade Federal Fluminense	22°53'49.56"S	43° 7'34.49"O
60	UFRPE	Universidade Federal Rural de Pernambuco	8° 0'49.17"S	34°56'53.49"O

61	UFRRJ	Universidade Federal Rural do Rio de Janeiro	22°46'6.23"S	43°41'6.16"O
62	UNIVILLE	Universidade Regional de Joinville	26°15'14.47"S	48°51'28.58"O
	Canada:			
63	Newfoundland	Memorial University of Newfoundland	47°34'25.67"N	52°43'58.46"O
64	Brock	Universidade Brock	43° 7'3.25"N	79°14'51.72"O
	Chile:			
65	UACH	Universidad Austral de Chile	39°48'22.51"S	73°15'0.69"O
	Germany:			
66	ZMT	Leibniz-Zentrum für Marine Tropenforschung	53° 6'28.82"N	8°50'45.53"L
67	RWTH	RWTH Aachen University	50°46'48.20"N	6° 3'56.47"
	Japan:			
68	EHIME	Ehime University	33°51'0.54"N	132°46'21.04"L
	Peru:			
69	MD	Museo de Delfines	12°27'53.73"S	76°46'5.30"O
	Romania:			
70	Iassy	University of Iassy	47°10'29.76"N	27°34'26.69"L
	Spain:			
71	CIEMAT	Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas	40°27'18.45"N	3°43'36.02"O
72	IDAEA	Institute of Environmental Assessment and Water Research	41°23'15.23"N	2° 6'53.82"L
	United Kingdom:			
73	Plymouth	Plymouth University	50°22'33.07"N	4° 8'22.56"O
74	Dundee	University of Dundee	56°27'29.27"N	2°58'55.83"O
75	St Andrews	University of St Andrews	56°20'24.89"N	2°47'48.15"O
	USA:			
76	Columbia	Columbia Univesity	40°42'40.01"N	73°56'29.22"O
77	Cornell	Cornell University	42°27'12.42"N	76°28'24.61"O
78	A&M	Texas A&M University	30°37'6.36"N	96°20'11.41"O
79	UF	University of Florida	29°38'33.99"N	82°21'17.96"O
80	UW	University of Washington	47°39'19.21"N	122°18'12.67"O
81	Virginia Tech	Virginia Polytechnic Institute and State University	37°13'42.18"N	80°25'24.30"O
82	WLU	Washington and Lee University	37°47'25.75"N	79°26'41.84"O

Appendix C. Networks of scientific collaboration addressing human threats to cetaceans in Brazil based on 103 publications. Each circle represents an institution (n = 82), and the connection link the institutions that collaborate. The area of the circles is proportional to the degree of centrality of the institution. The acronyms of all the institutions are informed.



Appendix D. List of 82 institutions involved in 103 scientific articles on human threats to cetaceans in Brazil published between 1986 and 2016 and their respective contributions in the scientific collaboration network detailed in degrees and betweenness values.

Institution	betweenness	degree
A&M	0	6
AQUASIS	113.1221654	16
AVN	0	3
BioPesca	130.1570978	25
Brock	0	10
CetAsia	0	5
CIEMAT	0.2222222	13
Columbia	0	4
Cornell	0	5
Dundee	1.3443182	3
ECOMAMA	0	1
EHIME	0	6
EMBRAPA	0	4
Everest	0	2
FIOCRUZ	225.4661369	18
FMA	87.3938823	12
FURG	427.4717971	31
Humboldt	0	8
IAL	0	4
Iassy	0	5
IBAMA	0	5
IBJ	30.4994621	9

ICMBIO	34.9080110	11
ICRA	1.4838097	12
IDAEA	28.7774078	19
IDSM	35.9381364	14
IEPA	0	8
INPA	308.2936035	14
INT	0	4
IPeC	32.5157007	12
IRD	0	5
MD	0	2
ME-CAN	0	12
MPEG	0	2
NEMA	0	4
Newfoundland	0	3
OMACHA	0	10
ORCA	8.9109065	15
PBF	75.6400488	8
PGR	0	3
Piagacu	0	4
Plymouth	0	4
PUC	58.4731093	13
RWTH	0	4
St Andrews	0	3
TAMAR	4.9008866	4
UA	45.3234775	11
UACH	0	1
UEMA	0	10
UENF	448.6591569	28
UERJ	540.4076494	39
UERN	0.6186869	5
UESC	0	2
UF	33.7990496	6
UFBA	5.2435481	8
UFC	0	5
UFES	20.1331789	11
UFF	2341544039	18
UFG	0	5
UFJF	387.5498518	17
UFPA	28.8500412	11
UFPB	0	4
UFPE	100.9312467	13
UFPR	8.9024598	12
UFRGS	0	4
UFRJ	657.9570871	41

UFRN	14.6688766	7
UFRPE	0	4
UFRRJ	78.0000000	5
UFSC	51.9961601	9
ULG	35.6037138	17
UNESP	18.8298463	7
UNICAMP	0	3
UNIR	12.7462662	8
UNIRIO	2.8133700	5
UNIVILLE	2.9492691	13
USP	219.8557787	21
UW	0	1
Virginia Tech	0	2
WLU	0	2
WWF	0	8
ZMT	27.4881791	10

CAPÍTULO 2

ASSESSMENT OF CONSERVATION ORGANIZATIONS' EFFECTIVENESS REGARDING CETACEAN CONSERVATION IN THE WESTERN ATLANTIC OCEAN

ASSESSMENT OF CONSERVATION ORGANIZATIONS' EFFECTIVENESS REGARDING CETACEAN CONSERVATION IN THE WESTERN ATLANTIC OCEAN

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Abstract

Conservation Organizations focused on cetaceans have played an important role in minimizing the risk of threats and fostering the recovery of dolphins and whales worldwide. This study seeks to provide data to stimulate and strengthen partnerships, and provide lessons that may help these organizations improve the effectiveness of cetacean conservation. Our major goal was to examine which factors influence this conservation effectiveness. From questionnaires surveys and exploratory analysis, we investigate Conservation Organizations concerned with cetacean conservation from Argentina, Brazil, Uruguay, and the United States of America. Our results indicate that the number of Conservation Organizations has been growing since 1895. The three action fields most cited by participants were (a) outreach and education; (b) conducting their own cetacean research; and (c) participating in Governmental issues/trying to influence policy. The main factors that influenced the effectiveness of participants efforts at cetacean conservation were: (a) level of financial resource; (b) number of staff; (c) variety of spatial extent of action; (d) number of studied species; (e) number of publications; (f) the intensity of collaboration; and (g) number of fields of work. The main difficulties mentioned were: (a) fund-raising and (b) lack of political influence at Federal, State, and Local government levels. We also found that the collaboration between organizations could be limited. We highlighted that there are locations lacking cetacean-related study, which require conservation effort. For example, there is a need for studies on bycatch and marine debris threats. From these findings, we conclude that: (a) fundraising skills; (b) capacity to translate scientific information to decision-makers; (c) basic research on species biology and environmental characteristics; and (d) networking capacity are features of paramount importance. We recommend organizations wishing to improve cetacean conservation effectiveness to: (a) assess their conservation effectiveness, (b) recognize the features which warrant special attention, (c) identify their networking performance and potential partnerships, (d) enhance bridges for Conservation Organization cooperation, and (e) expand their work in locations lacking cetacean research.

Keywords: Environmental Organizations; dolphins; whales; NGOs; Action plans; Collaboration; Management; Conservation effectiveness.

1. Introduction

Conservation Organizations (COs) (governmental organizations, non-governmental organizations or non-profit organizations) have played an important participatory role in biodiversity preservation, management and recovery. Stimulating society's environmental awareness, denouncing or exerting social pressure against damaging activities, and disemminating important research to the media are examples of COs' contributions (Jacobi, 2000).

This study is about COs that address the conservation of cetaceans (whales, dolphins, and porpoises). Contributions of the organizations dedicated to cetacean conservation often include, for example: influence the creation of legislation, lobbying

policymakers, respond to cetacean stranding, develop outreach and education programs; and conducting and sponsor research activities.

Knowledge and information are key sources of COs power with respect to politics (e.g. Betsill and Elisabeth, 2008; Keck and Sikkink, 1998). Nevertheless, COs only authored 15.5% produced scientific papers and reports and they participated sparsely in the scientific collaboration network of the published research on threats to cetaceans in Brazil (Marega-Imamura et al., 2020). On the other hand, COs are often a keystone instrument in conservation projects informing policymakers about the local needs and priorities (Nita et al., 2018) and advocating for the conservation of cetaceans worldwide.

Cetacean species face several negative impacts, such as environmental degradation, bycatch, and noise from, and collissions with, motorized vessel traffic (Rocha-Campos et al., 2011). The International Whaling Commission (IWC) is the international competent authority for the management of cetacean hunting, and as such takes a major role in coordinating, reviewing and studying the conservation of cetaceans.

Although IWC was established in 1946, it was only in the mid-1960s that COs started to attend IWC meetings (Bailey, 2006). At the beginning of the 1970s, COs were considered an active non-state force that could exert influence on whaling negotiation (Betsill and Elisabeth, 2008). Later, in 1982, at a time when the IWC consisted of 57 member nations, the COs had a strong influence which led to the enactment of a moratorium on commercial whaling, which took effect in 1986 (Andresen, 1998; Peterson, 1992).

IWC has as members governments from countries all over the world and its role has expanded and may be reflected in the foundation of COs aiming cetacean's conservation worldwide. Since the 1970s, the number and influence of COs increased dramatically worldwide (Cadman et al., 2020; Biermann & Pattberg, 2012). At the same time, there has been an increase in research on cetaceans in Argentina, Brazil and Uruguay (Pinedo and Castelo, 1980).

Argentina, Brazil and Uruguay were the initial proponents for the creation of a "South Atlantic Whale Sanctuary (SAWS)" by IWC (Palazzo Jr., 2006). The proposal for the SAWS was endorsed by COs such as Instituto Australis (Projeto Baleia Franca, Brazil), Instituto Boto-cinza (Brazil), Instituto Baleia Jubarte (Brazil), Organización para la Conservación de Cetáceos (Uruguay), Oceana (USA) and Conservation International (USA). It aimed to ensure that commercial whaling become permanently banned within the southern Atlantic. However, although a proposal for this sanctuary has been

repeatedly submitted to the Commission, it has not achieved the majority of votes needed to become enacted by the IWC.

Regardless, Brazil and Uruguay have already declared their territorial waters Sanctuaries for whales and dolphins, but Argentina has yet to do so (BRASIL, 2008; URUGUAY, 2013). Within the waters of the United States of America, the cetaceans are protected under the federal Marine Mammal Protection Act, which amongst other protections makes commercial whaling illegal (although there is a provision for indigenous whaling) (MMPA - USA, 2017).

However, without a concrete management plan, the Sanctuaries cannot achieve their mission to protect marine species in both territorial and Exclusive Economic Zone waters. Furthermore, protection against hunting does not guarantee the growth and population recovery of all species, mainly because there are other threats to cetaceans, such as by-catches. Moreover, simply designating a Sanctuary does not automatically imbue conservation – management of such a protected area, must be coordinated, requires cooperation across national boundaries, fundings, trained staff, enforcement and well-targeted actions.

Several actions of the proposed SAWS Management Plan depend upon solid, collaborative research. Maximizing cooperation between COs, and coordinating and standardizing research methodologies is considered to be important for the achievement of several SAWS objectives (Palazzo Jr., 2006). However, there is a lack of studies inventorying and evaluating COs, their effectiveness and how they communicate or collaborate. To ensure effective conservation of cetacean species, we need to know a "who's who" of the organizations working on cetacean conservation and, then, measure the effectiveness of the actions.

This is the first study to assess the effectiveness of COs focused on the cetacean conservation in their study areas. Our study sought to understand three major questions:

(1) Who are the COs currently operating in Argentina, Brazil, Uruguay and the United States of America?

(2) Which factors influence the effectiveness of the COs' cetacean conservation actions?

(3) What lessons can be learned for future cetacean conservation projects?

To address these questions our objectives were: (a) identify and characterize the COs regarding their context and partnerships; (2) measure and investigate which factors

influence the COs' conservation effectiveness; (3) determine the main conservation obstacles faced by the COs.

To reach our goals, we interviewed representatives of cetacean conservation organizations from Argentina, Brazil, Uruguay and the U.S. The Brazilian action plans aimed for the conservation of cetacean species (NAPs) were used as a template for potential cetacean conservation actions (BRASIL, 2019; BRASIL, 2010a; BRASIL, 2010b). The study provided lessons on how to improve the effectiveness of conservation actions related to cetacean conservation and give information to strengthen the partnerships between COs in the study areas.

2. Methods

2.1. Study subject

This study investigates the actions of the Conservation Organizations (COs) from Brazil, Argentina, Uruguay and the Atlantic coast of USA that are involved with the conservation of cetaceans. The inclusion criteria to participate in this study were organizations [governmental organizations (GOs), non-governmental organizations (NGOs), non-profit organizations (NPOs) or private institutions (PI)] that have at least one cetacean species as target of conservation actions.

We conducted a preliminary survey with senior researchers from the cetacean conservation field and applied snowball sampling (Goodman, 1961) where they indicated potential additional COs participants. We identified fifty-eight COs as the subject of our research, eight from Argentina, 25 from Brazil, 24 from the USA and one from Uruguay (Figure 1).

2.2. Survey

We contacted the key representatives (such as president, director or coordinator) of each CO. These informants were chosen due to their role in the CO and their availability. We sent a personal invitation letter by e-mail to each potential participant explaining the research project and containing a link to a online questionnaire (google forms).

We structured the questionnaire into two sections consisting of open-ended and multiple-choice questions for the collection of qualitative and quantitative data. The first section contained questions on time of existence, finance, staff, cetacean anthropogenic threats, the spatial extent of their actions, the fields covered by their actions, research

fields developed, target species, accomplished tasks and difficulties. In cases where the respondent answered that the CO carries out projects directed to one or two main cetacean species (see target species in Table 1), we directed them to answer the subsequent set of questions. The questionnaire sought to also gain information on the 'missions' of the COs, i.e., their main objectives.

The second section of questions was based on the conservation actions cited in three national action plans aimed at the conservation of cetacean species (NAPs) (Rocha-Campos et al., 2011; Di Beneditto et al., 2010; Rocha-Campos et al., 2010). NAPs focused on the conservation of aquatic mammals were developed by ICMbio (Instituto Chico Mendes de Conservação da Biodiversidade) (BRASIL, 2019; BRASIL, 2010a; BRASIL, 2010b) in collaboration with governmental and non-governmental organizations, researchers and specialists. The NAPs guide and establish priority actions (low, medium and, high priority) aimed at the conservation of species present in the Brazil Red of Threatened Species of Fauna (ICMBio, 2018).

The large cetaceans and pinnipeds NAP aimed, via 146 specific actions, to preserve 16 species of aquatic mammals, including nine species of large cetaceans (Rocha-Campos et al., 2011). The Small Cetaceans NAP contained 107 actions to preserve seven species of small cetaceans (Rocha-Campos et al., 2010). An exclusive NAP was developed for the Franciscana (*Pontoporia blainvillei*), due to scientific evidence about the unsustainability of bycatch and entails 88 actions (Di Beneditto et al., 2010). The three NAPs have a common aim of reducing the anthroppogenic impacts to prevent the decline of the populations.

The questionnaire sought to also gain information on the COs and their degree of accomplishment for the actions in the NAPs (see research topics in Table 1). For each NAP action, the respondents were asked to indicate at what stage of achievement they had achieved to date, or lack thereof. We excluded those NAP actions that were not in the remit of COs such as the management of agreements or government policy. We also adapted or excluded those actions that were very specific to the Brazilian region and/or domestic legislation.

Table 1. List with the description of possible answers, conversion of variables, and statistical analysis of each research topic addressed in this study.

Research topics	Possible answers	Conversion of variables	Statistical analysis
Characteristics			
Time of existence	Indicate the year of foundation	Time of existence = 2020 - the year of foundation	Explanatory variables at Generalized Linear Model (GLM) analysis
Financial	The annual average of CO financial resources: zero, between USD 1 and 10.000, between USD 10.000 and 100.000, between USD 100.000 and 500.000, between USD 500.000 and 1 million, between USD 1 and 5 million, and more than USD 5 million	Categorized as classes 1 to 7	Explanatory variables at GLM analysis
Staff	Average annual staff number of the CO, including : directors, secretaries, media staff, administrators, environmental education board, research board, trainees/internship, unpaid volunteers, outsourced area, others)	Total staff number	Explanatory variable at GLM analysis

Anthropogenic threats	Faced threats: Chemical pollution, construction of hydroelectric dams, marine debris, bycatch, intended capture, killing by resources competition, noise pollution, vessel collision, other	Percentage of threats	Exploratory analysis
Spatial extent of the actions	Local, Regional, National, Global	Sum of scales	Explanatory variable at GLM analysis
Activities			
Action fields	Conduct own cetacean conservation research, create laws/legislation, develop Environmental Impact Assessment (EIA), international treaties, lobbying (policymakers or regulations managers), member of Marine Mammal Health and Stranding Response Program, member of Projeto de Monitoramento de Praias (PMP) (Brazil), develop outreach and education programs, participating in Government issues, respond to stranded aquatic mammals, sponsors cetacean conservation research, incident response team, other.	Sum of action fields	Explanatory variable at GLM analysis

Research fields	Bioacoustics, environmental education, ethno conservation, demographic parameters, fishing interaction, genetics, health care, histologic, immunologic, morphologic, physiologic, toxicological, other. Answer required from those who selected "conduct own cetacean conservation research" as an action field.	For each research field, the respondent must choose a scale number from 0 to 4 depending on the periodicity (0 - never; 1 - rare; 2 - occasional; 3 - frequent; 4 - every time). We summed all values.	Explanatory variable at GLM analysis
Target species	*Balaenoptera acutorostrata, Balaenoptera musculus, Cephalorhynchus commersonii, Delphinus delphis, Eschrichtius robustus, Eubalaena australis, Globicephala macrorhynchus, Grampus griseus, Inia geoffrensis, Lagenorhynchus australis, Lagenorhynchus obliquidens, Lagenorhynchus obscurus, Megaptera novaeangliae, Orcinus orca, Phocoena sinus, Physeter macrocephalus, Pontoporia blainvillei, Sotalia guianensis, Sotalia fluviatilis, Stenella frontalis, Stenella longirostris, Steno bredanensis, Tursiops truncatus*, other	For each species, the respondent must choose a scale number from 0 to 4 according to the frequency of the activities developed by the CO. We summed all values.	Explanatory variable at GLM analysis

Accomplished tasks	Number of published studies about cetaceans, contribution in cetaceans laws or regulations, annual attendance of major scientific meetings in the last 5 years (MOP to ASCOBANS, COP to CBD, COP to CITES, COP to CMS, AC of ESC, ENCOPEMAQ - Brazil, Meeting of the IPBES, IUCN - WCC, CMF - IWC, SC - IWC, CC - IWC, MSP to UNCLOS, ICCB - SCB, IMCC – SCB, WMM – SMM, WWC - WCA, SOLAMAC), partnerships (number of COs = 58), media communication range (own website, own social media, internal talks, internal newspapers/printed magazines, news in other websites, radio interviews, television interviews, external talks, external newspapers / printed magazines, others)	The total number of publications (i.e. books, book chapters, and scientific publications), the sum of laws, and the sum of meetings. Two variables on partnerships: *betweenness* and *degree* (Igraph centrality measures, see description of collaboration networks data analysis). For each media communication indicator, the respondent must choose a scale number from 0 to 4 according to the frequency (0 - never; 1 - rarely; 2 - occasionally; 3 - frequently; 4 - every time). We summed all values.	All explanatory variables at GLM analysis except "sum of laws" (exploratory analysis)
Effectiveness			
Action Plans	Target species and the number of actions. Amazon river dolphin (*I. geoffrensis*) and Tucuxi (*S. fluviatilis*), 34; Franciscana (*P. blainvillei*), 30; Bottlenose dolphin (*T. truncatus*), 30; Guiana dolphin (*S. guianensis*), 36; Orca (*O. orca*), 21; Spinner dolphin (*S. longirostris*), 24; Humpback whale (*M. novaeangliae*), 19; Right whale (*E. australis*), 19. We defined the level of the effectiveness of the COs accordingly of Action Plan Score where ≤ 20% - Low effectiveness; 21% to 40% - slight effectiveness; 41% to 60% - moderate effectiveness; 61% to 80% - high effectiveness and 81%	For each action, the respondent must choose a scale number from 0 to 4 according to the action accomplishment stage (0 - action never started; 1 - action in early-stage; 2 - action in intermediary stage; 3 - action is nearing completion; 4 - action totally completed). "Action Plan Score" = (((Sum of accomplished actions of low priority * 1) + (Sum of actions	Response variable at GLM analysis

	to 100% - extreme effectiveness. We then investigated what they have in common.	of accomplished of medium priority * 2) + (Sum of accomplished actions of hight priority * 3))*100) / Sum of total actions achievable	
Missions and effectiveness	Description of mission and conservation effectiveness	Main words addressed	Qualitative analysis with the software IRaMuTeQ
Difficulties of the CO	Primary difficulties during the execution of conservation actions: fund-raising; lack of political influence: federal government; lack of political influence: state government; lack of political influence: local government; human resources; conflicts on economic interests; relationship with the local community; relationship with partners.	For each difficulty, the respondent must choose a scale number from 0 to 4, (0 - extremely easy; 1- easy; 2 - moderate; 3 - hard; 4 - extremely hard). We summed values.	Response variable at GLM analysis

Abbreviations of scientific meetings: MOP to ASCOBANS - Meeting of the Parties to Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas; COP to CBD - Conference of the Parties to Convention on Biological Diversity; COP to CITES - Conference of the Parties to Convention on International Trade in Endangered Species of Wild Fauna and Flora; COP to CMS - Conference of the Parties to Convention on the Conservation of Migratory Species of Wild Animals; AC of ESC - Annual conference of European Cetacean Society; ENCOPEMAQ – Brazil - Encontro Nacional sobre Conservação e Pesquisa de Mamíferos Aquáticos; Meeting of the IPBES - Meeting of

the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services; IUCN – WCC - International Union for Conservation of Nature World, Conservation Congress; CMF – IWC - Commission meeting forum, International Whaling Commission; SC – IWC - Scientific Committee meeting forum, International Whaling Commission; CC – IWC - Conservation Committee meeting forum, International Whaling Commission; MSP to UNCLOS - Meeting of States Parties to United Nations Convention on the Law of the Sea; ICCB – SCB - International Congress for Conservation Biology, Society for Conservation Biology; IMCC – SCB - International Marine Conservation Congress, Society for Conservation Biology; WMM – SMM - World Marine Mammal Science Conference, Society for Marine Mammalogy; WWC – WCA - World Whale Conference, World Cetacean Alliance; SOLAMAC - Reunión de Trabajo de Expertos en Mamíferos Acuáticos y Congreso de la Sociedad Latinoamericana de Especialistas en Mamíferos Acuáticos; other - other meeting related to cetacean conservation.

2.3. Ethical guarantees to research participants

Because the use of human subjects, i.e., survey participants, the project was reviewed by the Research Ethics Committee (CEP) of the Universidade Estadual de Santa Cruz. As directed by Approval Opinion No. 3.232.110, in an attempt to protect the privacy of the COs participants we have opted for representing their names only as acronyms.

Before starting a survey, the participants were fully informed on the purpose of the research. We read the "Free and Informed Consent Form" to the respondent and asked him if they "agreed" or "disagreed" to particpiapte in the research. The Free and Informed Consent Form was signed by each participant authorizing the use of the data provided by the respondent for research purposes and, in turn, ensuring the anonymity of the participant.

2.4. Data analysis

2.4.1. Cetaceans' conservation collaboration network

We asked the respondents to indicate which COs they have ongoing partnerships with (i.e. data exchange for research, event organization or research paper collaboration). From these data, we built graphical images of the collaboration network. The resulting data were transformed into a matrix with entities (nodes) and relationships between them (edges) with the Igraph package version 1.2.4.2 (Csardi and Nepusz, 2006) for R platform (R Development Core Team, 2008). Within this matrix, each node represents a CO. The interactions among the COs were based on a combination of the number of intermediate nodes and binding weights. We investigated the centrality of COs in the network structure to highlight their position and role within the cetacean conservation network. We used three measures of the centrality of nodes to calculate the different nuances of influence of each CO (Hanneman and Riddle, 2005): the degree of centrality (*degree*) and the centrality of intermediation (*betweenness*).

The *degree* refers to the number of nodes to which the focal node is connected. The higher the *degree*, the larger the area of the circle depicted in the graph. A high *degree* means that the CO is likely to offer more opportunities of collaboration than other and a high extent with which collaboration is sought-after by others. COs with more connections tend to have more power and visibility.

The *betweenness* quantifies the number of times a node acts as a bridge along the shortest path between two other nodes. The greater the value of *betweenness*, the more centralized the circle is on the graph (Opsahl et al., 2010). A high *betweenness* means that

the CO is likely to act as brokers connecting subgroups and has more communication control within the wider network.

2.4.2. Missions of COs and effectiveness consensus

We defined the term "effectiveness" as the fulfillment of a determinate goal, that is, the ratio of expected results to the results achieved (ISO, 2005; Fleury, 2002). Since achievement of goals is one of the measures indicated to quantify effectiveness, the present study assumed that completion of the conservation actions of the NAPs would be the goal of all COs we evaluated.

Aiming to check if the definition of effectiveness by the COs was aligned with the definition we use in this study, we applied a lexicometric analysis with the free software package IRaMuTeQ version 0.7 alpha 2 (*Interface de R pour les Analyses Multidimensionnelles de Textes et de Questionnaires*) (Ratinaud, 2009). We called this check step as “effectiveness term consensus” in which we analyzed the corpus of text derived from the statements of mission and effectiveness informed by the respondents. To provide an overview of the statements of the COs, we generated a Classification Reinert Method analysis for statements about missions, a Similarity graph and a Word cloud for statements about effectiveness. The graphs reflect significant clustering of language, as well as meaningful links from individual words to clusters. We selected only the content words (i.e. nouns, adjectives, verbs and adverbs) for the text analysis.

2.4.3. Influence of the attributes on effectiveness of COs

A Generalized Linear Model (GLM) model, with a Poisson distribution and a log-link function (Zuur et al., 2009), was used to investigate the influence of twelve variables on the Action Plan Score (see descriptions in Table 1). Those variables were: acting time, financial class, total staff, spatial extent of the actions scale, total fields, sum of research, sum of species, total of publications, total of meetings, total media appearance communication range, *betweenness* and *degree* (see variables details in table 1). We conducted the analysis on Action Stat software 3.7 (Estatcamp, 2014).

3. Results

3.1. Response rates

Thirty-two of the 58 COs compiled were engaged primarily in the protection of one or two specific species of cetaceans (target species) while the other 26 COs were

engaged in a multitude of activities for the protection and conservation of biodiversity and conducted work on some cetaceans species, but not exclusively with cetaceans (Fig. 1).

By November 30th, 2019, 38 COs of the initial sample (n = 58), completed and returned the questionnaire. This corresponds to an average response rate of 65.5%. Return rates were six of eight from Argentina, 19 of 25 from Brazil, 12 of 24 from USA and one of one from Uruguay. Most of the COs were NPOs (n = 18), followed by NGOs (n = 14), GOs (n = 5) and PI (n = 1).

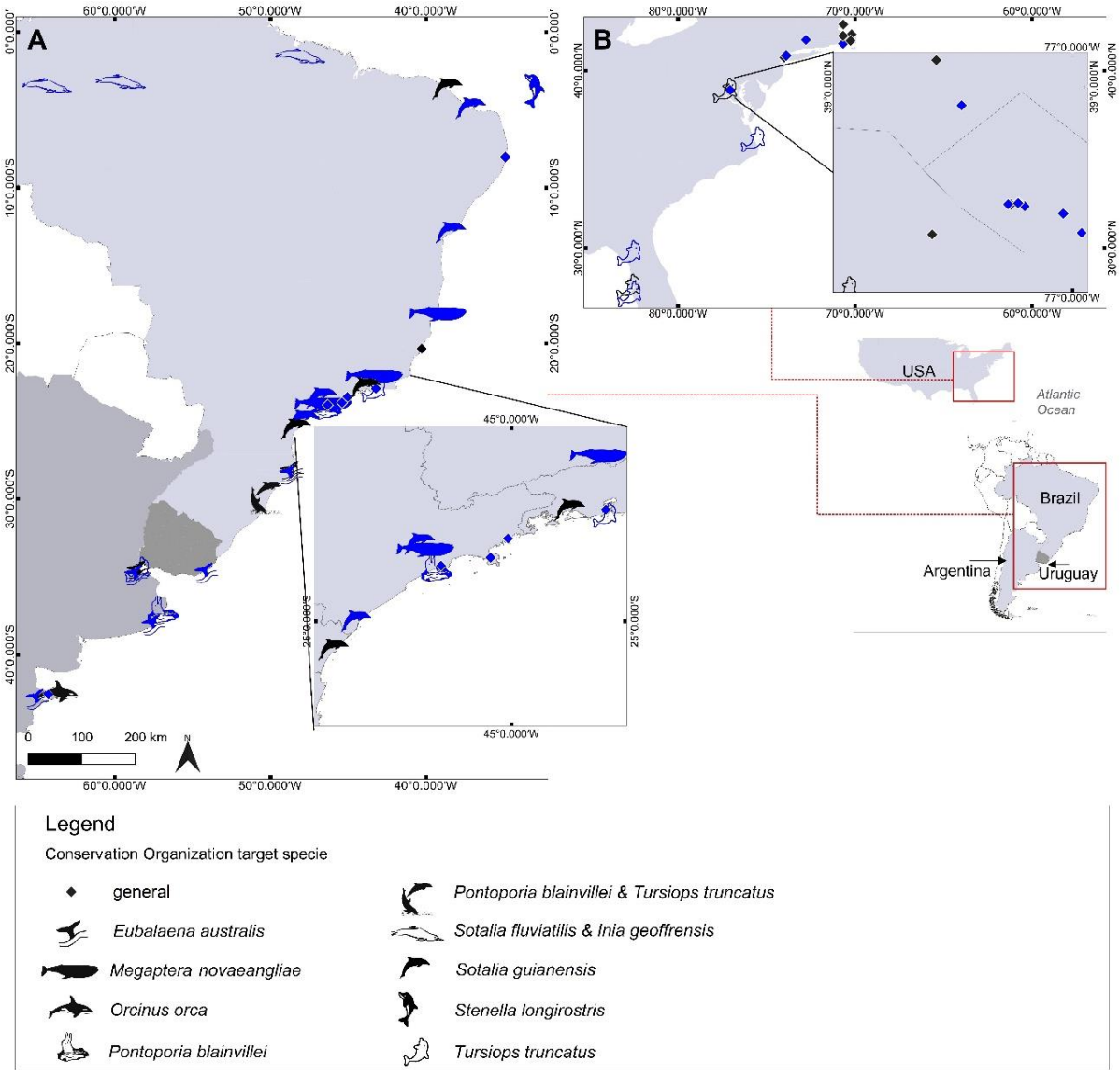

Fig 1. Geographic distribution maps of the main headquarters of the 58 Cetacean Conservation Organizations (COs) pre-identified to compose the study. A - Map of the South American continent and B - and eastern United States of America territory. The squares present the region with the highest concentration of the COs. Each symbol represents the CO target species. The lozenge symbols indicate the general COs, those

that are engaged in a multitude of activities for protection and conservation of biodiversity and works with some cetaceans' species, but not exclusively. The blue symbols indicate the COs respondents of our survey.

3.2. COs' characteristics

3.2.1. Time of existence

The 58 COs were founded from between 1895 and 2016. More than half of the COs (65.5%; n = 38) were founded between 1996 and 2016 (Fig. 2).

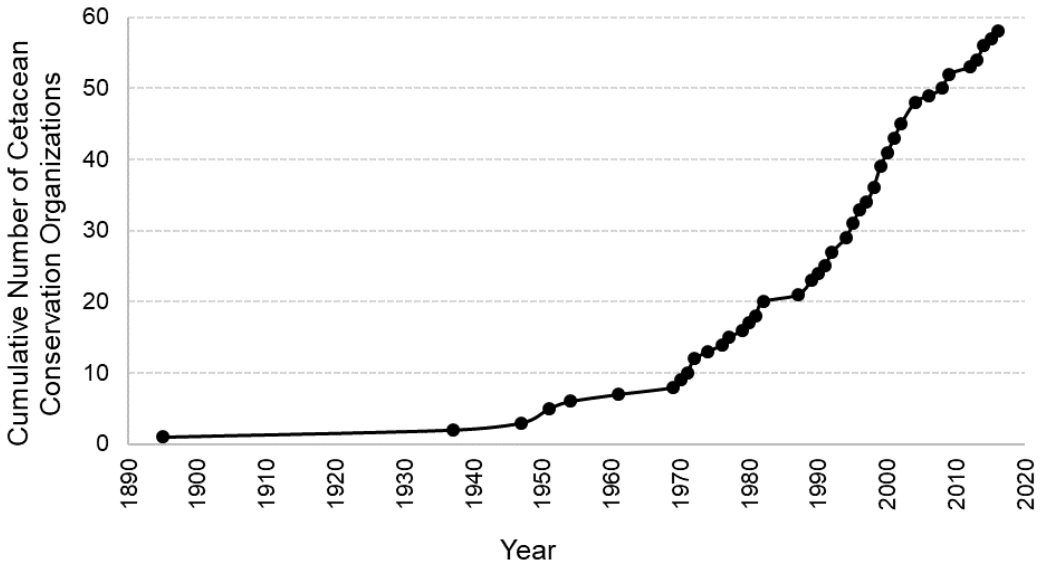

Fig. 2. Annual cumulative number of Cetacean Conservation Organizations according to the 58 Cetacean Conservation Organizations (COs) in this study. More than a half of the COs (65.5%; n = 38) were founded between 1996 and 2016.

3.2.2. Financial and staff support

Thirty-six COs responded with information about the annual average of their financial resources. The majority of COs reported a total annual income in class 3 (between USD =10,000 and USD 100,000) (n=10, 27.8%), followed by class 6 (between USD 1 million and USD 5 million) and class 7 (more than USD 5 million), represented by seven COs each (19.4%) (Fig 3). The number of CO staff varied from one to 123 (number of respondents = 34; mean ± SD = 24±4; median = 16).

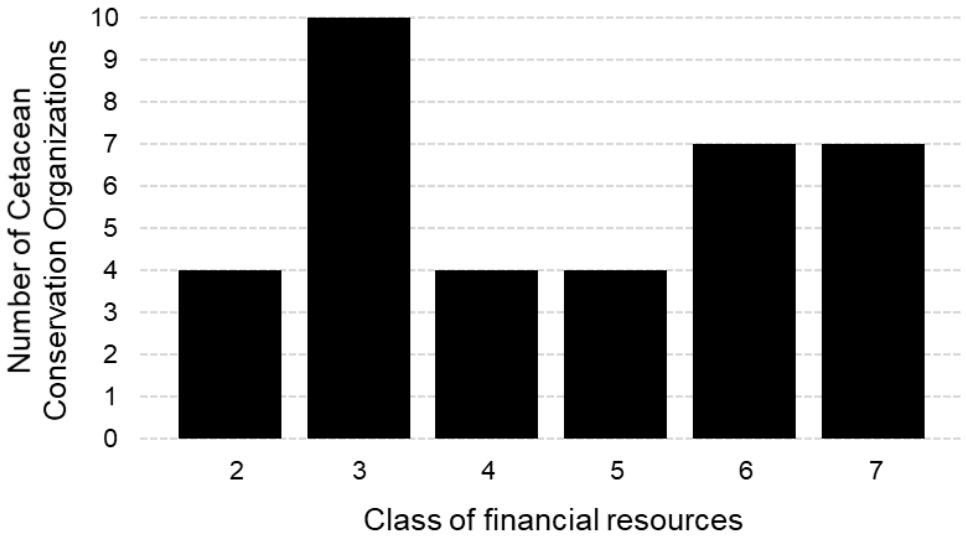

Fig 3. Number Cetacean Conservation Organizations by the class of annual average of financial resources: 1 - zero; 2 - between USD 1 and USD 10,000; 3 - between USD 10,000 and USD 100,000; 4 - between USD 100,000 and USD 500,000; 5 - between USD 500,000 and USD 1 million; 6 - between USD 1 million and USD 5 million; and 7 - more than USD 5 million.

3.2.3. Human threats and spatial extent of the actions

The five categories of anthropogenic threats most reported by the COs were: bycatch (n = 26; 68.42%); marine debris (n = 23; 60.53%); vessel collision (n = 22; 57.89%); chemical pollution (n = 19; 50%); and noise pollution (n = 18; 47.37%).

A similar number of COs reported the spatial extent of their actions to be at a local (n = 28), regional (n = 29) or national (n = 29) scale. Eighteen COs reported that they acted on a global scale (Table 2).

Table 2. List of anthropogenic threats dealt with by 38 cetacean Conservation Organizations (COs) (chemical pollution, construction of hydroelectric dams, marine debris, bycatch, intended capture, killing by resources competition, noise pollution, vessel collision, other) followed by the spatial extent of their actions (local, regional, national, global).

N	Country and CO name code	Chemical pollution	Construction of hydroelectric dams	Marine debris	Bycatch	Intended capture	Killing by resources competition	Noise pollution	Not apply	Vessel collision	Other	Local	Regional	National	Global
	Argentina														
1	ICB	x		x						x		x	x	x	x
2	FAQM				x							x	x	x	x
3	FM										x	x			
4	FPN								x					x	
5	WEF								x				x		
6	FDS	x		x	x			x		x		x		x	
	Brazil														
7	PGR				x			x		x		x	x		
8	AQS	x		x	x					x		x			
9	CMA	x		x	x			x			x			x	
10	FMA	x			x		x			x		x	x	x	x
11	GEMAM								x			x	x	x	x

12	GEMM											x	x	x	x
13	IAQ				x			x		x				x	x
14	IARG	x		x	x			x					x	x	
15	PBF		x		x	x	x					x	x	x	x
16	IBJ				x			x		x		x	x	x	
17	IBP	x		x	x	x				x	x		x		
18	IBC			x	x					x		x	x	x	
19	IDSM	x		x	x							x	x		
20	IPEC	x		x	x			x			x	x	x		
21	IMA								x			x	x	x	x
22	PBV	x		x	x	x		x		x	x	x	x	x	x
23	PIR	x		x	x							x			
24	AMPA	x		x	x			x		x				x	
25	VIVA			x	x					x	x	x		x	
	United States of America														
26	CKDP			x								x	x		
27	AWI	x		x	x			x		x			x	x	x
28	CSI								x				x	x	x
29	DW			x	x			x		x		x	x	x	
30	HSI	x	x	x	x	x		x		x		x	x	x	x
31	MMC			x	x	x				x		x	x	x	x
32	NOAA											x	x	x	
33	NRDC	x	x	x	x	x	x	x		x			x	x	x

34	OBXCDR				x			x		x		x	x	x	
35	SDP	x		x			x	x		x		x	x	x	x
36	TOF	x		x				x		x		x	x	x	x
37	WWF	x	x	x	x	x	x	x		x		x	x	x	x
	Uruguay														
38	OCC	x		x	x			x		x		x	x	x	x
	TOTAL	19	4	23	26	7	5	18	5	22	6	28	29	29	18

3.2.4. Action subjects and tasks

The three action fields most accomplished by COs were outreach and education (n = 37) followed by conducting their own cetacean conservation research (n = 29) and paticipanting in governmental issues (n = 23) (Table 3). The main cetacean research fields reported were environmental education research (n = 32), fishing interactions studies (n = 29) and researching cetacean demographic parameters (n = 26) (Table 4).

Table 3. List of Action fields and the corresponding number of Cetacean Conservation Organizations (COs) respondents in descending order (n total = 38).

Action fields	**Number of COs**
Outreach / education	37
Conduct own cetacean conservation research	29
Participating in Government issues	23
Respond to stranded aquatic mammals	19
Lobbying (policymakers or Regulations managers)	18
Create Laws/Legislation	16
Incident response team	15
International treaties	12
Sponsor cetacean conservation research	11
Member of Projeto de Monitoramento de Praias (PMP) (Brasil)	9
Other	8
Develop Environmental Impact Assessment (EIA)	3
Member of M. Mammal Health and Stranding Response Program	2

Table 4. List of research fields and the corresponding number of Cetacean Conservation Organizations (COs) respondents in descending order (n total = 38).

Research fields	**Number of COs**
Environmental education	32
Fishing interactions	29
Demographic parameters	26
Genetics	26
Health care	24
Histology	24
Bioacoustics	23

Ethno conservation	23
Morphology	23
Physiology	22
Toxicology	22
Immunology	20
Other	5

Twenty-three species were identified as a subject of protection by the COs (seven of them were mentioned by the respondents in the open-ended question option "other") (Appendix A).

The COs were primarily concerned with the conservation of the following species: common bottlenose dolphin (*Tursiops truncatus*) (number of COs = 27), humpback whale (*Megaptera novaeangliae*) (number of COs = 25), orca (*Orcinus orca*) (number of COs = 25), southern right whale (*Eubalaena australis*) (number of COs = 24), minke whale (*Balaenoptera acutorostrata*) (number of COs = 20), rough-toothed dolphin (*Steno bredanensis*) (number of COs = 20), sperm whale (*Physeter macrocephalus*) (number of COs = 18), Guiana dolphin (*Sotalia guianensis*) (number of COs = 18) (Table 5).

Table 5. List of twenty-three species identified subjects of conservation actions by 38 cetacean Conservation Organizations (COs) and the corresponding number of COs respondents targeting these species, in descending order.

Target species	**Number of COs**
Tursiops truncatus	27
Megaptera novaeangliae	25
Orcinus orca	25
Eubalaena australis	24
Balaenoptera acutorostrata	20
Steno bredanensis	20
Physeter macrocephalus	18
Sotalia guianensis	18
Globicephala macrorhynchus	17
Stenella frontalis	17
Delphinus delphis	16
Stenella longirostris	16
Grampus griseus	14
Balaenoptera musculus	13
Pontoporia blainvillei	13
Sotalia fluviatilis	11
Inia geoffrensis	9

Phocoena sinus	9
Eschrichtius robustus	8
Lagenorhynchus obscurus	7
Other	7
Cephalorhynchus commersonii	6
Lagenorhynchus obliquidens	6
Lagenorhynchus australis	2

In addition the COs were asked how many cetacean-related publications have they produced (books, book chapters and scientific papers), with the responses ranging from 0 to 216 (32 ± 8 - mean ± SD). Contributions to the development of specific laws and regulations affecting cetaceans ranged from one to eight (2±1). The mean annual attendance of major relevant scientific meetings reached 27% of 15 relevant meetings achievable (mean of the task accomplished /total achievable = 4/15). The mean number of partnerships with other Conservation Organizations was 16% (9/58) and the mean value of media range communication reached 58% (21/36) (Table 6).

Table 6. List of tasks accomplished by 38 respondant cetacean Conservation Organizations (and the corresponding values: minimum, mean, standard deviation (SD), median, maximum, total achievable and number of COs respondents).

Task accomplished	Min	Mean±SD	Median	Max	Total achievable	Number of respondents
Number of published studies about cetaceans	0	32±8	19	216	unlimited	34
Contribution in cetacean laws or regulations	1	2±1	2	8	unlimited	27
Annual attendance of major scientific meetings	1	4±0	3	10	15	38
Partnerships with other conservation organizations	1	9±1	7	39	58	37
Media communication range	8	21±1	21	36	36	37

3.2.5. Cetaceans' conservation collaboration network

Five COs were more influential in the cetaceans' conservation collaboration network with higher values of *degree* and *betweenness* (Fig. 3; Appendix B). Among these COs that contributed more in the network, three from Brazil, namely CMA (marine mammal/general CO), IBJ (target species: *M. novaeangliae*) and PBF (target species: *E.*

australis); one from Argentina (ICB; target species: *E. australis*); and one from USA (CSI; cetacean-oriented CO). These COs were highly involved in the cetacean collaboration networks with higher power and visibility (i.e., degree) and communication control (i.e., betweenness) within the wider network than other COs.

Even though there were those COs that had greater values of betweenness than other COs, most of the COs are marginally involved within the entire network. The few centralized nodes on the graph what means that the cetacean conservation collaboration network has 'weak bridges' towards CO cooperation.

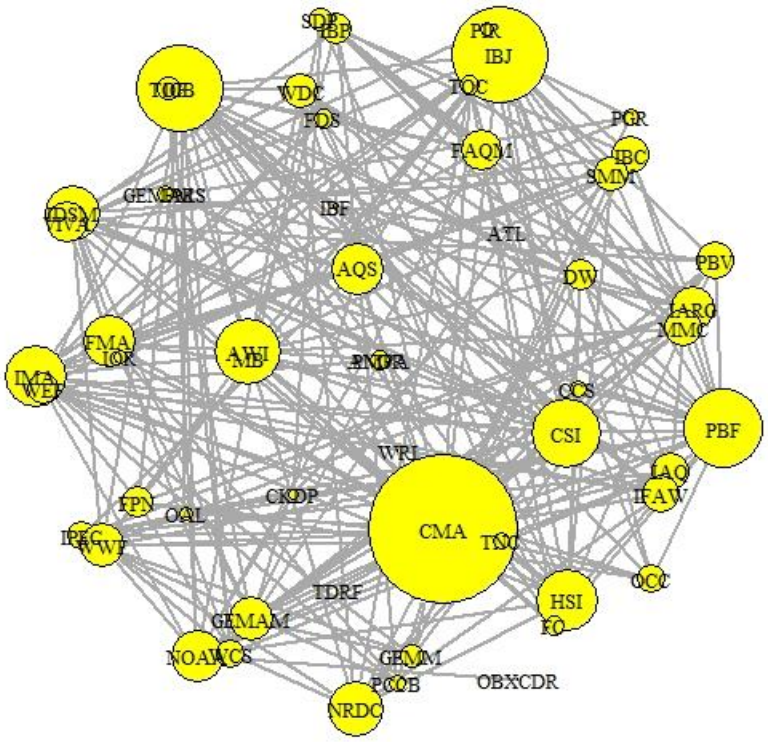

Fig. 4. The cetacean conservation collaboration network with 58 Conservation Organizations (COs) identified in this study. Each circle represents a CO and the connection link the COs that collaborate. The area of the circles is proportional to the degree of centrality of the CO. The five COs that contribute most to the network are three Brazilian (CMA, IBJ and PBF), one Argentine (ICB) and one American (CSI).

3.3. Effectiveness

3.3.1. Missions and effectiveness consensus

Open questions aimed at identifying relevant perceptions of CO missions and effectiveness. The Classification Reinert Method carried out in the software IRaMuTeQ classified the statements of COs about their organizational "missions" in four categories. The corpus in the filogram was divided into two subcorpora. The first subcorpus was represented by the Class 4, corresponding to 36.1% of the total of terms. The second subcorpus was divided into three classes, Class 1 corresponding to 16.7% of the total of terms with a second subdivision represented by the Class 2 corresponding to 27.8% of the total of terms and Class 3 corresponding to 19.4% of the total of terms (Fig. 5).

From this lexicometric analysis, we could abstract the main COs missions were, in decreasing order of relevance, the following 1) Contribute to animal life and their threats; 2) Collaborate protecting marine ecosystem; 3) Educate the community about whales and dolphins; and 4) Promote conservation actions to aquatic mammals.

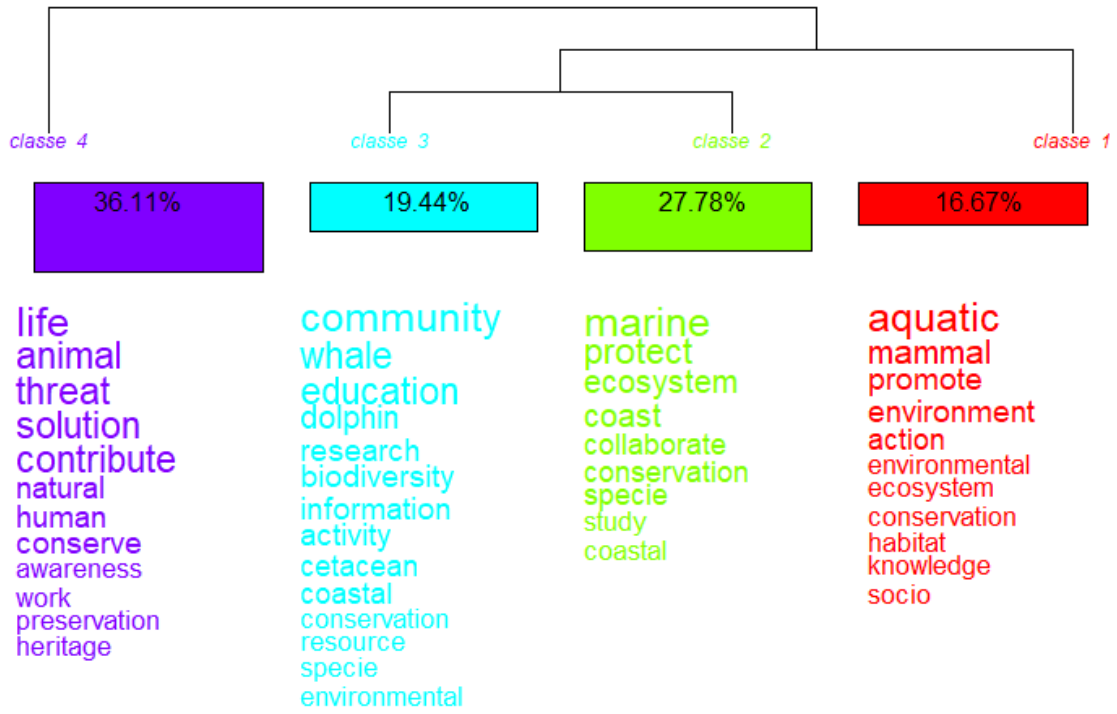

Fig. 5. Filogram with four categories of words result of the Classification Reinert Method carried out at the lexicometric analysis with statements of 38 cetacean Conservation Organizations responses about their organizational "missions".

Nineteen COs reported that they had a definition of “effectiveness”. To gain a consensus about the meaning of “effectiveness”, the most commonly used words in the response were determined. We identified two arrangements from the similarity graph: one arrangement with the terms “species” (n = 8), “community” (n = 5), “conservation” (n = 5), “achieve” (n = 3) and “recovery” (n=3); and a second arrangement with the terms “population” (n = 8), “impact” (n = 5), “minimize” (n = 3) and “size” (n=3) (Fig. 6).

From the similarity graph about what conservation effectiveness means for the COs we could extract the main ideas: 1) achieve recovery of species; and 2) minimize anthropogenic impacts on populations.

Overall, it means that the COs showed objectives similar to the NAPs on reducing anthropogenic impacts to prevent the decline of cetacean populations. This finding validates our use of NAP actions as a means to measure conservation effectiveness.

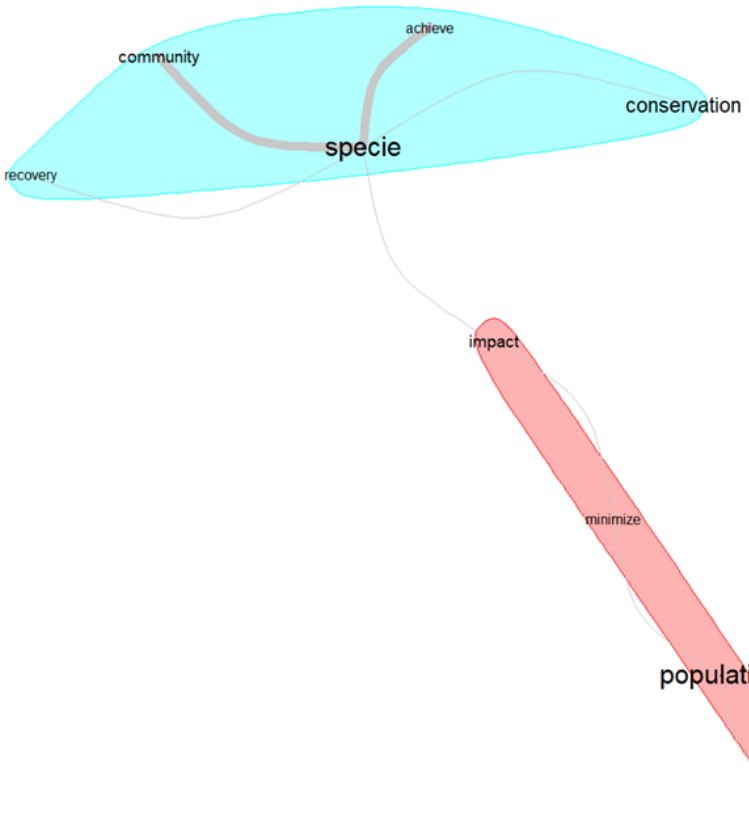

Fig. 6. Graphs result of the Similarity analysis carried out in the software IRaMuTeQ (Interface de R pour les Analyses Multidimensionnelles de Textes et de Questionnaires) at the lexicometric analysis with statements of 38 Cetacean Conservation Organizations about effectiveness. The size of the word is proportional to the frequency with which the word was mentioned. Colors used do not represent any aspect of analysis.

3.3.2. Action Plans

We obtained 22 complete responses to the second section of questions. This part had questions concerning the performance rate of action aiming for the given CO target species. The COs respondents comprised eight target species, six odontoceti: Amazon river dolphin (*Inia geoffrensis*), Franciscana (*Pontoporia blainvillei*), common bottlenose dolphin (*Tursiops truncatus*), Guiana dolphin (*Sotalia guianensis*), spinner dolphin (*Stenella longirostris*), tucuxi (*Sotalia fluviatilis*) and two mysticeti: humpback whale (*Megaptera novaeangliae*), southern right whale (*Eubalaena australis*).

The total percentage of action plan actions accomplished for each species were 45.83% (total range of action plan accomplished / total range achievable = 44/96) for *S. longirostris*; followed by 37.06% (169/456) for *E. australis*; 34.54% (105/304) for *M. novaeangliae*; 31.39%, (226/720) for *S. guianensis*; 31.18% (116/372) for *P. blainvillei;* 28.19% (203/720) for *T. truncatus*; and 14.89% (81/544) for *Inia geoffrensis* and *Sotalia fluviatilis* (Fig. 7).

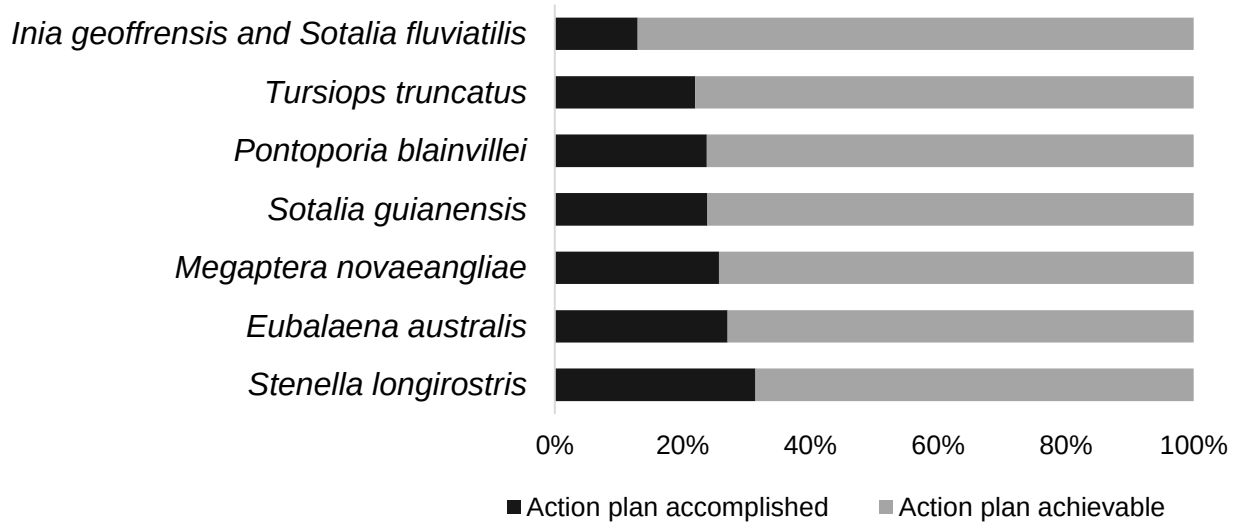

Fig. 7. Percentage of action plan accomplished (black) and achievable (grey) for each main target species of 22 Cetacean Conservation Organization subject of the study.

Four COs obtained a high score of conservation effectiveness (Table 7), comprising two from Brazil (IMA - general CO and IBJ – target species: *M. novaeanglia*), one from Uruguay (OCC - target species: *E. australis*) and one from USA (SDP – target species: *T. truncatus*).

We then investigated which features the four COs with high effectiveness scores have in common. The factors in common were: 1) they were NGOs; 2) they have a minimum of 20 years of experience; 3) their efforts are focused on one target species; 4) they conduct their own cetacean conservation research and also engage in education activities; 5) they develop, in a lesser or greater extent, research on bioacoustics, environmental education, ethno conservation, demographic parameters, fishing interaction, health and animal care studies; 6) their spatial extent of actions are at least on local, regional and national scales; 7) they helped in formulating at least one law or regulation; and 8) they have at least 12 employees. It should be noted that two of those COs were directly involved in the development of the NAPs, which may bias their effectiveness positively.

Table 7. List of twenty-two cetacean Conservation Organizations (COs) investigated with the respective abbreviation, country of origin, Action Plan Score and level of the COs' effectiveness. We defined the level of the effectiveness of the COs accordingly of Action Plan Score where ≤ 20% - Low effectiveness; 21% to 40% - slight effectiveness; 41% to 60% - moderate effectiveness; 61% to 80% - high effectiveness and 81% to 100% - extreme effectiveness.

Abbreviation	Country	Action Plan Score	Level of the COs' effectiveness
IMA	Brazil	79.41	High effectiveness
IBJ	Brazil	66.03	High effectiveness
OCC	Uruguay	64.10	High effectiveness
SDP	USA	63.11	High effectiveness
FDS	Argentina	54.49	Moderate effectiveness
ICB	Argentina	50.64	Moderate effectiveness
FAQM	Argentina	49.60	Moderate effectiveness
PGR	Brazil	45.10	Moderate effectiveness
IAQ	Brazil	44.87	Moderate effectiveness
IBP	Brazil	44.05	Moderate effectiveness
IBC	Brazil	43.53	Moderate effectiveness
AMPA	Brazil	37.18	Slight effectiveness
PBF	Brazil	37.18	Slight effectiveness
PIR	Brazil	31.15	Slight effectiveness
CKDP	USA	30.33	Slight effectiveness
VIVA	Brazil	26.92	Slight effectiveness
FM	Argentina	24.18	Slight effectiveness
AQS	Brazil	20.88	Slight effectiveness
IDSM	Brazil	20.19	Low effectiveness
OBXCDR	USA	16.39	Low effectiveness
IPEC	Brazil	15.88	Low effectiveness

FPN	Argentina	10.26	Low effectiveness
GEMAM	Brazil	4.49	Low effectiveness

3.3.3. Influence of COs' attributes on the effectiveness

Results of the GLM (see data in Appendix C) indicated that the Action Plan Score is influenced ($P < 0.05$) by eleven attributes (Table 8). Between these eleven attributes, the GLM highlighted the importance of six main ($P < 0.001$) attributes. The Action Plan Score was correspondingly higher to a higher financial class (i.e. class 5), a larger number of staff, a larger sum of the spatial extent of the actions (i.e. local+regional+national+global scales), a larger sum of protected species, a larger number of publications and a higher value of *degree* (collaboration network centrality measure). The Action Plan Score was also higher when the larger number of fields of work and when CO working at only one spatial extent of the action.

The model showed an influence inversely proportional to the Action Plan Score (i.e. negative value of estimate coefficient) concerning attending major scientific meetings and the number of research fields they were engaged in. The Action Plan Score was not significantly influenced by the acting time (i.e. how long they have been established); financial classes 3, 4 and 6; the total of spatial extent 2 and 3; the total of media appearance and *betweenness*.

Table 8. Explanatory variables, estimate coefficients E and *P*-values from the Generalized Linear Model test to measure the influence of 23 Cetacean Conservation Organizations attributes on Action Plan Score (a measure of effectiveness) with results of significance testing. *p < 0.05, ***p < 0.001.

Variables	E	P-Value
Acting time	0.026	0.192
Financial class 3	0.718	0.388
Financial class 4	0.196	0.19
Financial class 5	-3.180	<0.001***
Financial class 6	1.290	0.383
Total staff	0.023	<0.001***
Spatial extent of the actions scale 1	0.128	0.012*
Spatial extent of the actions scale 2	-0.005	0.988
Spatial extent of the actions scale 3	-0.187	0.742
Spatial extent of the actions scale 4	0.548	<0.001***
Total fields	0.529	0.019*
Sum research	-0.034	0.016*
Sum species	0.055	<0.001***

Total publications	0.009	<0.001***
Total meetings	-0.648	<0.001***
Total mídia appearance	0.001	0.99
Betweenness	-0.001	0.801
Degree	0.202	<0.001***

3.4. Difficulties faced by Conservation Organizations

Thirty-six COs responded to the question about the main difficulties they faced. For each category, the respondent could rank from zero to 4 (where 0 meant extremely easy and 4 extremely hard), with maximum score reachable for each category being 144.

The main difficulties mentioned were fund-raising (n = 102) and lack of political influence at Federal government level (n = 102), followed in decreasing order by: lack of political influence at State government level (n = 96); lack of political influence at Local government level (n = 86); human resources (n = 71); conflicts on economic interests (n = 64); links with local community (n = 57); and links with partners (n = 56) (Fig. 8).

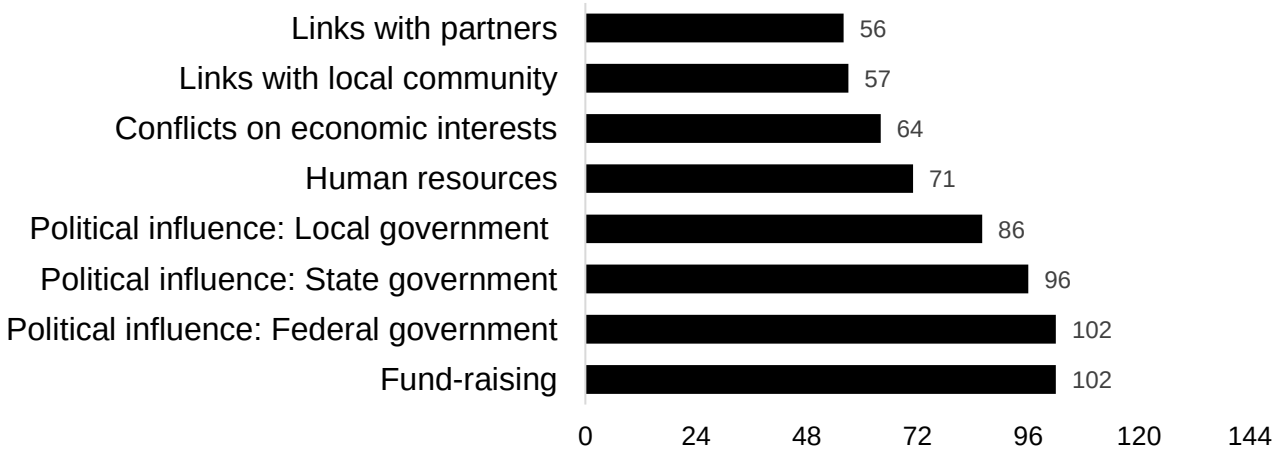

Fig. 8. Total sum of the scores for each difficulty category based on 36 Cetacean Conservation Organization responses. The maximum score achievable for each category of difficulty was 144.

4. Discussion

This study set out to understand the main factors that influence the conservation effectiveness of, and the ongoing challenges faced by, Conservation Organizations (COs) from the Western Atlantic Ocean engaged with cetacean conservation. By using structured questionnaires, we have been able to provide prominent features and quantify the cetacean conservation actions for 38 COs.

Response probability was correlated with the COs from the countries that were proposers for the creation of the Southern Atlantic Whale Sanctuary (SAWS). Notably, two of the COs we deemed to be scored highly for effectiveness were two major proponents of SAWS, suggesting that cetacean conservation effectiveness is an important issue for these respondents.

In previous work, the Nature Conservancy's defined two measures for Environmental Organization mission success: biodiversity health and threat reduction (Sawhill and Williamson, 2001). These were in turn considered to be successful surrogates for mission success (Sawhill and Williamson, 2001). These findings corroborate with our results on the COs perceptions about conservation effectiveness: 1) achieve recovery of species; and 2) minimize the impacts on populations. From the lexicometric analysis, we also found the following COs strands of missions: 1) contribute to animal life and reducing threats to animals; 2) collaborate with respect to protect marine ecosystem; 3) educate the community about whales and dolphins; 4) promote conservation actions on aquatic mammals. These findings comply directly with the NAPs' objectives which validates our approach of using the plans as a tool for a measurement conservation effectiveness.

4.1. Factors that influence the cetacean conservation effectiveness of COs

Through the Action Plan Score results, we provide a reference parameter of effectiveness. This effectiveness parameter might help COs to assess and measure their advances towards the conservation of their target species. We also provided the effective COs common ingredients: conducting own cetacean research; conduct education activities; developing research on bioacoustics, environmental education, ethno conservation, demographic parameters, fishing interaction, health and animal care studies; the spatial extent of their actions are at least on local, regional, and national scales; and acting in public polices. We observed that the most effective COs were NGOs that focus their efforts on one target species, have a minimum of 20 years of experience and have at least 12 employees.

Our research identified that eight attributes have a positive influence on the Action Plan Score (i.e., our index of cetacean conservation effectiveness): a high level of financial resources; number of staff; wide spatial extent of activities (e.g. local to international); only one spatial spatial level of conservation action (e.g., local or national); number of studied species; number of publications; collaboration; and number of fields

of research work. Surprisingly, our analysis shows an influence that inversely proportional attending major conservation meetings and the number of research fields engaged in, on cetacean conservation effectiveness. Although attending cetacean conservation and science-related meetings was not a factor that positively influenced cetacean conservation effectiveness, the attendance of COs at key meetings, such as the IWC and the NAP meetings should be considered. These key conservation meetings provide an exchange of crucial information and engagement in the decision-making and law-making process.

The COs reported a notable number of published studies about cetaceans. Nevertheless, the values may be underestimated as many COs were not able to provide a full and accurate tally of research published by their staff. The inclusion of available science is one of the characteristics of successful marine conservation (Lundquist and Granek, 2005). We hypothesize that the high effectiveness scores may be due to the wide range of basic research they conduct. These studies represent a crucial knowledge of species biology and environmental characteristics, which enable better-directed conservation activities. On the other hand, a previous review showed that NGOs represented only 18% of the institutions involved in research dealing with human impacts on cetaceans in Brazil (Marega-Imamura et al., 2020).

The COs focused mainly on the conservation of *T. truncatus* - this is in good agreement with the findings of previous research which found that most institutions in Brazil were focusing on threats to *T. truncatus* (Marega-Imamura et al., 2020).

Besides *T. truncatus*, we found *B. acutorostrata*, *E. australis*, *M. novaeangliae*, and *S. bredanensis* were frequently focused by by COs. The later four species are categorized as “least concern” (LC) in the IUCN Red List of Threatened Species (IUCN, 2020; Kiszka et al., 2019; Wells et al., 2019; Cooke, 2018a; Cooke, 2018b; Cooke and Zerbini, 2018). The higher number of COs focused on these species, and therefore, a higher total conservation effort may have contributed to their good conservation status. Especial attention must be given to some species with populations in recovery. Southern right whale (*E. australis*) had a population recovery of 14% per year between 1987 and 2003 (Groch et al., 2005). South Atlantic humpback whales had a population recovery of 27% between 2008 and 2012 (Bortolotto et al., 2016; Cooke, 2018b). This humpback whale population has argueably shown a recovery rate above the plausible limit for the species (Wedekin, 2017). For both species, *E. australis* and *M. novaeangliae*, we found high conservation action scores; reflecting the high effort put towards their recovery.

Actions directed towards *S. longirostris* conservation also garnered a high score but the data was from a single CO.

Conversely, although *S. guianensis* was among the species with more COs focusing on their conservation and with 61 institutions that conducted studies aiming at the species threats in Brazil (Marega-Imamura et al., 2020), the species' IUCN status is "near threatened" (Secchi et al., 2018). Furthermore, because individuals of *S. guianensis* inhabits coastal water as bays and estuaries, the species face higher intensity of human impacts as noise pollution from boat traffic and coastal development, water pollution through waste disposal and habitat loss (Marega-Imamura et al. 2018).

Likewise, *O. orca* and *P. macrocephalus*, with even with more COs focusing on their conservation, present categories of threats that require attention, as "data deficient" (DD) and "vulnerable" (VU) under the IUCN, respectively (Taylor et al., 2019; Reeves et al., 2017). This fact may reflect logistical difficulties and high expense involved in conducting research upon these animals via the seasonal distribution patterns of *O. orca* (Hauser et al., 2006) and the long diving periods of *P. macrocephalus* (Pirotta et al., 2011).

Cetacean conservation is a complex undertaking due to the difficulty and expense of collecting field data. It may explain why, although the NAPs cited actions aiming at these species, we did not find any CO targeting exclusively the conservation of sometimes more offshore, deep waters and elusive species such as *Balaenoptera borealis, B. physalus, B. edeni*, *Physeter microcephalus, B. bonaerensis, B. musculus, and B. acutorostrata*.

Given that our findings are based on a limited number of COs, mostly in South America, there should be some caution noted with extrapolation to other regions. We are aware that our research may have two main limitations. The first is that we estimated the effectiveness only of the specialist COs (i.e. the COs that focus on one or two cetacean species as the main target of their conservation efforts). We could not measure the efficacy of 26 more general COs, those that are engaged in a multitude of activities for protection and conservation of biodiversity, including a number of cetacean species. Among those general COs, were that ones that had a higher level of total financial resources, (more than USD 5 million) and those that had been established for longer. The time of the establishment was expected to be one attribute with a major influence on effectiveness, skewing the length operation in the COs analysed by not including these general COs may have downplayed the importance of being long established. The second

is that most of the general COs included in our survey were not able to inform us of how much of their total financial budget is invested only in cetacean conservation.

To fill these gaps, two important issues must be subject to further investigations: how could we measure the cetacean conservation actions and effectiveness of the general COs? Also, does having greater financial resources really lead to having greater conservation effectiveness?

Bycatch is currently the greatest threat to marine mammals worldwide (Gelcich et al., 2014; Read et al., 2006) and many countries focus their efforts on directing plans to reduce this threat (e.g., Argentina - Consejo Federal Pesquero, 2016). We found that bycatch was the second most reported threats by the COs, nevertheless, a previous study showed that less than 20% of the published studies were focused on this threat (Marega-Imamura et al., 2020). A lack of data on the threat of marine debris has also been reported (Marega-imamura et al., 2020; Simmonds, 2012), although was a category of threat reported, and being addressed by more than half of the COs in our survey. We strongly suggest to COs increase their efforts and research on levels bycatch and the threats posed by marine debris.

Another overarching issue on cetacean conservation we found is the gap of knowledge and actions along the great length of the coast of the surveyed countries. Our findings indicate that the places with the highest concentration of COs are located mainly in southeast Brazil. The concentration of COs on the Brazilian southeast coast corresponded to the places with the greatest number of Universities and, hence, study areas aimed at the conservation of cetaceans (Marega-Imamura et al., 2020). This fact highlights a concentration of cetacean conservation efforts that may be related to the availability of financial resources and logistical convenience, but we argue that cetacean conservation concern should be primarily driven by scientific data and need rather than funding opportunities. Thus, there is a need to minimize the bias of localization of cetacean studies and conservation efforts. We recommend the COs to expand their partnerships with Universities or, when possible, strive to establishment new research bases in areas lacking in cetacean research, particularly the coastal areas with resident populations of dolphins.

The high influence of working on a variety of local, regional, national and global scales on effectiveness evidences the relevance of transboundary collaboration among the actors aiming at the cetaceans and the conservation of their habitat. For this transboundary conservation to succeed, the conservation actors' interests must be aligned and should

consider the development of integrated monitoring actions, coordinated abundance and distribution surveys, and studies on habitat use, pollution, epidemics, and the development of stranding networks (Authier et al., 2017; Dallimer and Strange, 2015).

Half of the surveyed COs indicated that they were involved in stranding response programs. The stranding response programs are collaborative networks, often sponsored by big companies, for example, the countries investigated in this paper develop programs as Brazilian Marine Mammal Stranding Network (REMAB-Brazil), Punta Norte Orca Research (Argentina), NOAA National Marine Fisheries Service Marine Mammal Health, and Stranding Response Program (U.S.).

Our findings provide insights about the relevance of COs collaborative networks. Through the current network analysis, each CO will be able to see their position in the analysis and whether there is a need for improvement in their collaboration. The conservation effectiveness of COs increased proportionally to the CO's connectivity to others. COs that are very connected can quickly offer opportunities for collaboration and eventually hold most information. The exchange of data and knowledge may enable better decision-making, which leads to a high effectiveness conservation action. For example, IBJ was among those that most collaborate with the network also one of the most effective COs.

Overall, the cetacean conservation collaboration network illustrates weak bridges of CO cooperation. It should be noted that the network analysis did not include COs that did not respond to our survey – although it could be argued that such COs are thus indicating that they may not be good at collaboration and sharing information through this lack of participation.

4.2. Context of COs currently operational in Argentina, Brazil, Uruguay, and the U.S.A

More than half of the COs in this study were founded from 1996 to 2016 most of them were NGOs. Globally, since the 1990s, environmental NGOs have become increasingly important for decision-making, because of their ability to build capacity in policy development, and facilitate connections between decision-makers and the public (Hasler et al., 2019; Doern et al., 2015).

Providing expertise and policy analysis, bridge interactions between government and stakeholders, transmit scientific data and information to decision-makers and conduct education and citizen awareness programs are the main competencies of an NGO (Cadman et al., 2020; Agarwal, 2008). Our findings corroborate with these competencies

as the studied COs show a major contribution to the tasks: developing laws and regulations on cetacean conservation, participating in Government issues, conducting outreach and education, and conducing their own cetacean conservation research.

4.3. Lessons learned for future projects aiming at cetacean conservation

Our work substantiated the assumption that fundraising ability is often critical to the project's success (Seixas and Davy, 2008). However, even though the higher financial status influenced effectiveness, the COs reported fund-raising as the main difficulty.

Biodiversity conservation budgets have always been scarce (Prideaux, 2015; James et al., 1999); on the other hand, after reaching COs, much of this funding can be spent inefficiently. Consequently, even if financial resources available to reduce or eliminate threats, the COs may not always have a successful impact on conservation as funds gains may not translate equally to conservation action attained. Measuring conservation effectiveness for specific key actions helps ensure that funds are well, and efficiently spent to achieve conservation results (Ferraro and Pattanayak, 2006).

The lack of political influence at Federal, State and Local government levels were reported as the main challenges faced by the COs. To protect their authority and legitimacy, scientists and policymakers usually create intellectual boundaries (Hastings, 2011) and these two stakeholder groups may interact little. To tackle these issues and the science change in policy we believe that the COs must work as boundary organizations. Boundaries are defined as the "socially constructed and negotiated borders between science and policy, between disciplines, across nations, and across multiple levels" (Cash and Clark, 2001; Jasanoff, 1987). The three main features of a Boundary organization are networking capacity, transparency, and capacity to translate scientific information into the managers' and policymakers' language (Cash & Clark 2001).

As recommended at the Southeast and Mid-Atlantic Marine Mammal Symposium (SEAMAMMS - Panel: Marine Mammal Policy, Present, and Future, Washington, DC March 2019), the communication is the key to science, therefore for real conservation, there is a need of effectiveness in the aspects political, management, law-making, (Parsons et al., 2017, Parsons, 2016) and science (Rose and Parsons, 2015). The same Panel recommended that the Organizations must have staff responsible for passing the findings on to decision-makers.

Connecting scientists to managers and policymakers at multiple scales benefits all sides. Lundquist & Granek (2005) argued that between the key challenges to the success

of marine conservation efforts are the: (1) instability of governments and management institutions; and (2) limited scientific information.

Another challenge we met is that almost all the CO respondents do not measure the success of their conservation actions. This fact substantiates previous findings in the literature, where the difficulty of measuring mission success by nonprofit organizations has long been recognized (Jones, 2012; Fowler, 1996). In a previous work, the Nature Conservancy interviewed thirty other nonprofit organizations and none of them had measures for success (Sawhill and Williamson, 2001).

5. Conclusion

The study provided the first integrated survey of COs that protect cetaceans in Argentina, Brazil, Uruguay and the USA. Investigating the COs this work has highlighted key essential information to facilitate conservation actors to locate potential partners and identify needs. We provided an initiative to bring lessons of how to improve the effectiveness of cetacean conservation actions and give information on where to strengthen the partnerships between Conservation Organizations. One contribution of our research was the identification of the COs conservation effectiveness. Using this index COs might in the future, be able assess and measure their conservation success for their species or focus.

This paper sought to examine the major question: which factors influence the effectiveness of the cetacean conservation? From our findings, this paper has shown the main factors that may influence positively in conservation effectiveness: level of financial resources; number of staff; acting at multiple levels – from local to national; number of studied species; number of publications; the intensity of collaboration; and number of fields of research work. The study also provided the CO features of paramount importance: networking capacity; transparency; and the capacity to translate scientific information to decision-makers.

Towards enhancing our understanding of the weakness of the cetacean collaboration network and the utmost importance of solid cooperation among the COs for conservation effectiveness, an important lesson that also emerges from our findings is the importance of strengthening the bridges of COs cooperation. One hypothesis that emerges from our research is that spanning the boundaries of action is considered beneficial for the effectiveness of cetacean conservation.

Our work substantiated the assumption that fundraising skill is often critical but we also argue that the conservation action should be primarily driven by scientific data and conservation needs rather than funding opportunities. Our study has led us to conclude that there is a need to focus more research on areaswhere cetacean studies are lacking, particularly coastal areas with resident populations of dolphins. Taking into account that many cetacean threats may be common to multiple areas, but the intensity at which it occurs may differ by location, we strongly suggest to COs increase their efforts and studies on bycatch and marine debris threats over a broad area. We also encourage CO cooperation with COs working on similar species, and for them to collaborate: sharing data and resources, and to work together to reduce redundance, to be more efficient and to fill gaps in information.

One important lesson that also emerges from our findings is that there is no perfect formula for enhancing cetacean conservation effectiveness; however, we note that there are some common components.

In conclusion, we suggest for each concerned CO follow these steps:

1) Identify their conservation effectiveness;
2) Recognize the features, which warrant special attention: fundraising skill, basic researches on species biology and environmental characteristics, studies and action on bycatch and marine debris threats, work on translating and transmitting scientific information to decision-makers;
3) Identify networking performance and potential partnerships;
4) Strengthen bridges of cooperation with COs protecting species in common;
5) Expand their work into locations lacking cetacean studies.

From this research, some major additional questions were raised: why are more specialists COs in South American countries than in the USA, and what might the consequences be?

Lastly, the COs might improve their effectiveness by applying tools and lessons learned from our conclusions. These findings thus need to be interpreted with caution, once the conservation effectiveness for target cetacean species can be the result of the interplay of the factors. Recommendations are specific to the community concerned with cetacean conservation but transferrable to other animal groups, subjects of conservation. Further research on the correlations between these factors would be very insightful.

The major contribution of our research was the identification of the main factors that may influence conservation effectiveness. The COs might improve their effectiveness by applying tools and lessons learned from our results. We encourage the COs find out which other COs work with focus species they have in common and exchange data and knowledge. The effectiveness index we developed might help COs to reassess and measure the conservation advances for their target species, in the future.

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List of Appendices

Appendix A. List of 38 Cetacean Conservation Organizations (COs) subjects of this study, and the corresponding target species. E - Specialist CO, those engaged in the protection of one or two target species.

N	Country and CO name code	*Balaenoptera acutorostrata*	*Balaenoptera musculus*	*Cephalorhynchus commersonii*	*Delphinus delphis*	*Eschrichtius robustus*	*Eubalaena australis*	*Globicephala macrorhynchus*	*Grampus griseus*	*Inia geoffrensis*	*Lagenorhynchus australis*	*Lagenorhynchus obliquidens*	*Lagenorhynchus obscurus*	*Megaptera novaeangliae*	*Orcinus orca*	*Phocoena sinus*	*Physeter macrocephalus*	*Pontoporia blainvillei*	*Sotalia guianensis*	*Sotalia fluviatilis*	*Stenella frontalis*	*Stenella longirostris*	*Steno bredanensis*	*Tursiops truncatus*	Other
	Argentina																								
1	ICB		x				E								x										
2	FAQM	x			x		x								x			E						x	
3	FM						x								x									E	
4	FPN			x			E						x		x									x	
5	WEF	x		x	x		x	x					x	x	x		x							x	
6	FDS						E																		
	Brazil																								
7	PGR													x								E			
8	AQS	x					x	x	x				x	x	x		x		E		x	x	x	x	
9	CMA	x	x		x		x	x	x	x				x	x		x	x	x	x	x	x	x	x	
10	FMA	x						x	x					x	x		x		x		x	x	x	x	
11	GEMAM	x	x		x				x	x				x			x		E	x			x	x	
12	GEMM	x	x		x		x	x	x	x				x	x		x	x	x	x	x	x	x	x	Me
13	IAQ				x				x	x				x	E		x	x	x	x	x	x	x	x	
14	IARG	x			x		x	x	x					x	x		x	x	x		x		x	x	
15	PBF						E																		
16	IBJ	x					x	x	x					E	x		x	x	x		x		x	x	
17	IBP	x			x		x							x	x			E	x		x	x	x	x	
18	IBC																		E		x		x		
19	IDSM							x		E				x			x		x	E			x		
20	IPEC																	x	E						
21	IMA	x			x		x	x	x					x	x		x		E		x	x	x	x	

22	PBV				x		x							x	x			x	x		x			x	x	Bab
23	PIR						x							x	x									x	E	Bab
24	AMPA									E										E						Ia, Ib
25	VIVA													E				x	x							
	United States of America																									
26	CKDP																								E	
27	AWI	x	x		x	x	x	x		x			x		x	x	x	x			x	x	x	x	x	Sc, Ce
28	CSI	x	x				x							x	x	x	x									
29	DW	x	x			x		x						x	x	x							x		x	Eg
30	HSI	x	x	x		x	x	x	x			x		x	x	x				x	x	x			x	
31	MMC	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
32	NOAA	x	x	x	x	x	x	x	x			x	x	x	x		x				x	x	x	x		
33	NRDC	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x		
34	OBxCDR																								E	
35	SDP							x	x							x		x	x		x	x	x	E		
36	TOF	x	x		x	x	x							x	x	x	x									
37	WWF	x	x		x	x	x	x		x		x	x	x	x	x	x			x		x	x	x		
	Uruguay																									
38	OCC						E																	x		
	Total	20	13	6	16	8	24	17	14	9	2	6	7	25	25	9	18	13	18	11	17	16	20	27	7	

Species abbreviations: Bab - *Balaenpotera brydei*; Ce - *Cephalorhynchus hectori*; Eg - *Eubalaena glacialis*; Ia - *Inia araguaiaensis*; Ib - *Inia boliviensis*; Me - *Mesoplodon sp.*; Sc - *Sousa chinensis*.

Appendix B. List of 38 Cetacean Conservation Organizations (COs) subjects of this study and their respective contributions in the scientific collaboration network detailed in number of parnerships, degree and betweenness values in descending order according to *degree*.

CO code	**name**	**partnerships**	***degree***	***betweenness***
CMA		39	43	411.8274535
IBJ		17	28	104.2845353
ICB		19	25	98.7937544
PBF		23	23	98.5677846
CSI		8	20	128.764902
AWI		13	19	30.4635091
IMA		15	18	61.6309146
HSI		14	18	52.5004943
IDSM		10	16	23.7341397
NRDC		11	16	32.040855

NOAA	3	15	124.3941854
FMA	6	15	13.6702512
AQS	7	15	14.0125279
WWF	8	13	21.5509818
GEMAM	10	13	66.6513425
IARG	10	13	49.183808
VIVA	7	12	8.3642258
FAQM	7	12	29.8784848
MMC	0	11	34.8924762
IAQ	7	11	11.6616221
IBC	7	11	8.5806843
PBV	6	11	26.3212854
IBP	5	9	63.5665494
FPN	5	9	11.0174926
WEF	10	9	63.0512516
DW	6	9	0.7740568
OCC	3	8	8.9753794
IPEC	4	8	5.4669573
GEMM	4	7	4.0568456
SDP	6	7	6.6337632
TOF	7	7	57.1397186
AMPA	5	6	3.1642229
FDS	2	6	3.5170504
PGR	2	5	10.4858685
PIR	4	4	1.1273217
CKDP	4	3	0.4133333
FM	1	2	0.5384804
OBxCDR	1	1	0

Appendix C. Table of explanatory variables (acting time, financial class, total staff, spatial extent of the actions scale, total fields, sum of research, sum of species, total publications, total meetings, total partnerships, total midia, *betweenness* and *degree*) and response variable 'Action Plan Score' used to run the GLM analysis.

CO code	**name**	**Acting time**	**Financial Class**	**Total staff**	**Spatial extent of the actions scale**	**Total fields**	**Sum research**	**Sum species**	**Total publications**	**Total meetings**	**Total midia**	***Betweenness***	***Degree***	**Action Plan Score**
FAQM		26	3	10	4	4	14	9	20	3	22	29.8784848	12	49.60
FM		14	2	11	1	2	15	8	14	1	9	0.5384804	2	24.18
FPN		31	3	15	1	2	8	7	3	1	12	11.0174926	9	10.26
AQS		26	5	15	1	8	32	26	22	2	23	14.0125279	15	20.88
AMPA		20	4	7	1	6	35	14	92	4	28	3.1642229	6	37.18

IAQ	16	6	20	2	6	27	44	18	5	18	11.6616221	11	44.87
PBF	5	6	46	4	6	18	4	23	3	30	98.5677846	23	37.18
IBP	18	4	20	1	4	34	22	36	3	24	63.5665494	9	44.05
IDSM	21	6	100	2	4	36	15	24	6	24	23.7341397	16	20.19
IPEC	23	6	24	2	3	20	6	37	2	18	5.4669573	8	15.88
IMA	25	3	16	4	10	37	34	50	7	26	61.6309146	18	79.41
VIVA	6	3	3	2	5	8	8	0	3	15	8.3642258	12	26.92
GEMAM	7	2	18	4	6	38	19	10	4	0	66.6513425	13	4.49
CKDP	19	2	16	2	3	32	4	4	1	18	0.4133333	3	30.33
SDP	38	5	12	4	6	30	13	216	1	19	6.6337632	7	63.11
PIR	6	3	7	1	4	7	19	16	2	21	1.1273217	4	31.15
IBJ	24	6	35	3	10	38	23	103	9	25	104.2845353	28	66.03
IBC	11	3	1	3	6	26	8	21	2	15	8.5806843	11	43.53
OCC	20	3	38	4	6	12	6	4	3	25	8.9753794	8	64.10
OBXCDR	12	3	5	3	2	10	4	3	2	18	0	1	16.39
PGR	30	6	11	2	3	28	6	34	1	26	10.4858685	5	45.10
ICB	24	4	28	4	6	32	9	47	5	26	98.7937544	25	50.64

II. CONSIDERAÇÕES FINAIS

No presente estudo investigamos as redes de colaboração científica e a efetividade de ações voltadas a conservação de cetáceos. A partir de uma revisão sistemática da literatura publicada nos últimos trinta anos, apresentamos o panorama das pesquisas sobre impactos antrópicos em cetáceos. Nesse panorama, apontamos os temas, espécies, áreas de estudo investigadas e instituições envolvidas. Além disso, investigamos quais são e onde estão distribuídas as Organizações conservacionistas da Argentina, Brasil, EUA e Uruguai que possuem ações voltadas a conservação de cetáceos. Também avaliamos quais fatores influenciam na efetividade de conservação dessas Organizações e quais as maiores dificuldades enfrentadas. Por fim, identificamos as redes de colaboração de pesquisa empírica e de práticas voltadas a conservação de cetáceos. Nossos achados podem auxiliar pesquisadores e ambientalistas a identificarem potenciais parceiros de pesquisa e no direcionamento de estratégias para conservação de cetáceos.

Uma das lições levantadas por esse estudo, é que embora não exista uma fórmula unânime que possa ser estabelecida para que os atores de conservação alcancem uma elevada efetividade de conservação, alguns componentes são primordiais. Dentre esses componentes, enfatizamos que o aumento da colaboração entre pesquisa, prática e tomada de decisão é crucial para que todos os outros componentes possam ser fortalecidos e, portanto, alcançarmos um maior sucesso na conservação dos cetáceos.

IIa. Linha do tempo

Com o contexto abordado e resultados do presente estudo, traçamos uma linha do tempo com os principais acontecimentos da conservação de cetáceos no Atlântico (Figura IIa.1). A partir dos nossos achados verifica-se que as ações para conservação de cetáceos no Oceano Atlântico vêm se intensificando desde 1895, com a fundação da primeira ONG conservacionista nos Estados Unidos da América (Wildlife Conservation Society - WCS). Observamos ainda que mais da metade das Organizações conservacionistas da Argentina, Brasil, Estados Unidos da América e Uruguai surgiram a partir de 1996. Este mesmo ano, coincide com a publicação dos primeiros estudos sobre ameaças antrópicas em cetáceos no Brasil, sendo que entre 2011 e 2016 mais da metade desses estudos foram publicados. Por fim, verifica-se que os primeiros estudos com ameaças antrópicas sobre misticetos (voltados a *Megaptera novaeangliae*) no Brasil se iniciaram em 2006.

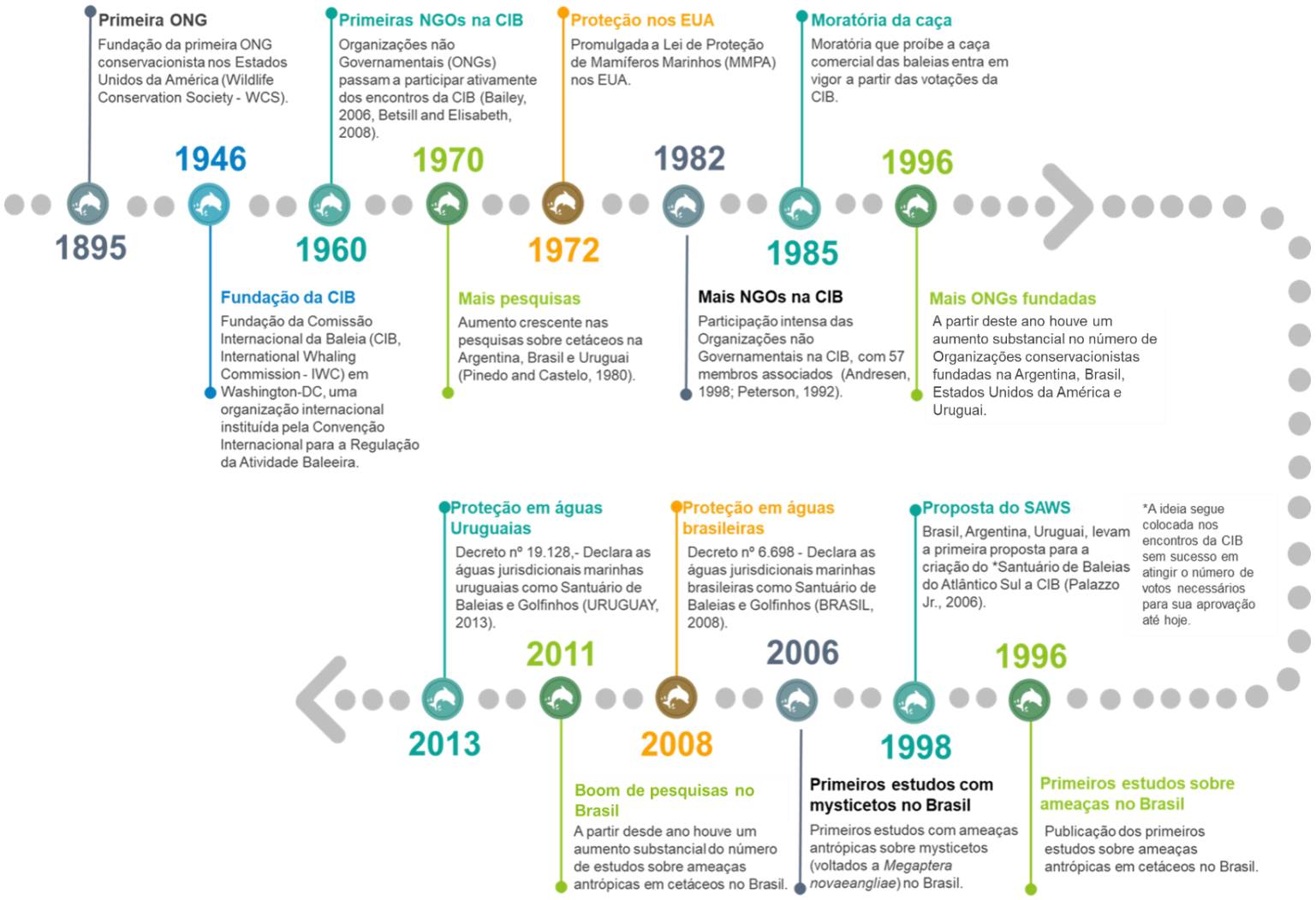

Fig. IIa.1. Linha do tempo sobre a conservação de cetáceos no Atlântico elaborada a partir dos achados e contexto abordados na tese de doutorado "Conservação de cetáceos no Oeste do Atlântico: Colaboração, ação e efetividade".

IIb. Sugestões

Recomendamos aos representantes de Organizações conservacionistas 7 passos a partir dos achados do presente estudo:

1. Identificar a efetividade de conservação da sua Organização;
2. Reconhecer características que merecem atenção especial como: habilidade em captação de recursos financeiros, pesquisa de base (biologia da espécie e características ambientais do habitat), pesquisa e ação sobre impactos de captura

incidental e entulho marinho, habilidade de interlocução com tomadores de decisão;

3. Identificar o desempenho de colaboração da sua Organização e potenciais parceiros;
4. Consolidar as parcerias que já possui, principalmente com aquelas Organizações que possuem espécies alvo de conservação em comum;
5. Fortalecer as Organizações menores (i.e. com pouco tempo de atuação, menos recursos financeiros e menor impacto/repercussão), principalmente as que estão localizadas em áreas com populações de cetáceos ameaçados ou habitats críticos;
6. Ampliar a área de atuação em locais com populações de cetáceos que ainda não foram estudados;
7. Divulgar seus dados de forma clara e concisa, suas estratégias, e também as falhas de conservação, visando a melhoria do planejamento de ação para a conservação das espécies.

Visando melhorias e continuidade da presente pesquisa, sugerimos que trabalhos futuros busquem:

1. Avaliar e aprimorar a medida de efetividade de conservação de cetáceos em parceria com pesquisadores e ambientalistas interessados; criando/usando indicadores mensuráveis e se possível, padronizados entre as instituições;
2. Avaliar qual a combinação dos fatores aqui avaliados que confere um maior impacto na efetividade de conservação e adaptar seus projetos a esses fatores (e outros potencias que podem surgir);
3. Desenvolver formas de avaliar a efetividade de ONGs generalistas em relação a atuação na conservação de cetáceos;
4. Abranger a investigação de efetividade de conservação mundialmente;
5. Incorporar o conceito de eficiência de conservação (i.e. quantidade de ações *versus* recurso financeiro disponível);
6. Cruzar dados geográficos da conservação de cetáceos no Atlântico considerando: a distribuição das espécies, a distribuição das pesquisas realizadas*, localização e intensidade de ameaças, localização de Áreas Marinhas Protegidas, localização de Institutos* e grupos de pesquisa e localização das Organizações

Conservacionistas* possibilitando a identificação de mais parcerias e lacunas de conservação (*dados que foram levantados no presente estudo).

IIc. Próximos passos

Planejamento estratégico global

A conservação de qualquer grupo de espécies é um processo contínuo e as estratégias de ação devem ser reavaliadas constantemente (REEVES et al., 2003). Através das entrevistas realizadas nesse estudo, apenas quatro Organizações responderam que medem o sucesso das ações que realizam, porém, nenhuma delas possui indicadores precisos de efetividade. Observamos ainda, com os resultados do capítulo 2, que a captação de recursos financeiros e o interesse político em todos os níveis (local, regional e nacional) são as maiores dificuldades enfrentadas para a execução das ações voltadas a conservação de cetáceos. É papel do governo solucionar conflitos de interesses econômicos, subsidiar recursos financeiros e uma melhor distribuição desses recursos voltados a conservação. Estes, são desafios que muitas vezes as Organizações conservacionistas não conseguem interferir diretamente, entretanto, outras estratégias podem ser consideradas. Diante do recurso escasso para conservação e falhas na comunicação entre pesquisa, atores de conservação e tomadores de decisão; duas estratégias podem ser adotadas pelas Organizações: 1 - uma melhor alocação dos recursos e 2 – uma melhor capacidade de interlocução com o governo. A partir dessas constatações, definimos como próximo passo dessa pesquisa um planejamento estratégico global.

Desde a década de 90, os projetos de conservação estão cada vez mais focados no monitoramento e avaliação da fauna para que os seus objetivos sejam alcançados. Esta abordagem vem do interesse das Organizações conservacionistas em serem prudentes no uso de recursos financeiros, e pelo interesse das agências de financiamento em abordagens que apresentem um maior custo-benefício (FERRARO & PATTANAYAK, 2006). A quantidade de recurso financeiro a ser investido em ações de conservação é uma decisão importante a ser tomada pelos coordenadores de projetos de conservação (SALZER & SALAFSKY, 2006). De acordo com Salzer e Salafsky (2006), para que sejam tomadas decisões adequadas, as Organizações devem responder às questões: "Qual o atual estado do nosso grupo/espécie alvo?" e "As ações que executamos tem o resultado

pretendido?". Podemos complementar ainda duas questões abordadas por Margoluis et al. (2013): “Selecionamos as melhores intervenções para alcançar o nosso impacto desejado?” e “Estamos executando nossas intervenções da melhor maneira possível?”. Para auxiliar que Organizações encontrem essas respostas e mensurem constantemente o sucesso de conservação das espécies, pretendemos elaborar um planejamento global a partir da ferramenta desenvolvida pela Conservation Measures Partnership (CMP, Open Standards for the Practice of Conservation - http://www.conservationmeasures.org).

O CMP é uma ferramenta útil com uma estrutura conceitual clara que tem como objetivo transformar a prática da conservação da biodiversidade a partir da padronização de estratégias e medidas de efetividade e incentivo a adoção de melhores práticas. Os cetáceos estão sob ameaça de múltiplos impactos e as ferramentas regulatórias existentes são insuficientes para enfrentá-las, assim, essa ferramenta pode auxiliar as equipes a planejar sistematicamente seus projetos e determinar se estão no caminho certo. As principais etapas da CMP são: desenvolvimento de um modelo conceitual identificando as ameaças principais aos alvos de conservação (Cetáceos) e fatores contribuintes (que permitem ou contribuem que essas ameaças ocorram); planejamento estratégias baseados em um modelo conceitual (formados pelos itens anteriores), para assim realizar o planejamento das ações e monitoramento, com metas, objetivos, atividades, demandas, estratégias e indicadores; implementação das ações e monitoramento, análise dos dados para avaliação da eficácia das ações e adaptação do projeto para maximizar o impacto; coleta e compartilhamento dos resultados para promover o aprendizado (CMP 2003).

Elaboramos um Modelo conceitual prévio através do software Miradi 4.1.3 (https://www.miradi.org/) com ameaças diretas e indiretas, direcionado à conservação de cetáceos (Figura IIc.1). Pretendemos realizar na próxima etapa uma cadeia de resultados “Modelo ideal” com todos os entrevistados do presente estudo interessados. Essa cadeia de resultados consta da proposta ideal e suas etapas para conservação dos cetáceos. As relações causais entre os diversos impactos e ações devem ser apresentadas nestas cadeias. Através dessa etapa também é possível visualizar se uma proposta de ação atinge mais de uma espécie de cetáceo.

Os planos de ação Nacionais voltados a cetáceos (ROCHA-CAMPOS et al. 2011; BRASIL, 2010; DI BENEDITTO et al. 2010; ROCHA-CAMPOS et al. 2010) utilizados para nossa medida de efetividade do capítulo 2 direcionam em geral suas ações para as ameaças e não com as causas das ameaças. Para exemplificar, colocamos as metas dos PAN pequenos cetáceos e PAN grandes cetáceos no nosso modelo prévio apontando para

quais fatores poderiam estar intervindo (hexágonos amarelos - Figura IIc.1). O planejamento através dessa ferramenta se diferencia por poderem ser traçadas estratégias direcionadas aos fatores contribuintes que levam as ameaças diretas. Estratégias voltadas a esses fatores podem ser mais eficazes que na ameaça em si, visto que uma ameaça pode ser causada por vários fatores. Assim, pretendemos incluir outras estratégias que as Organizações já realizam ou poderiam incluir para maior efetividade da conservação dos cetáceos.

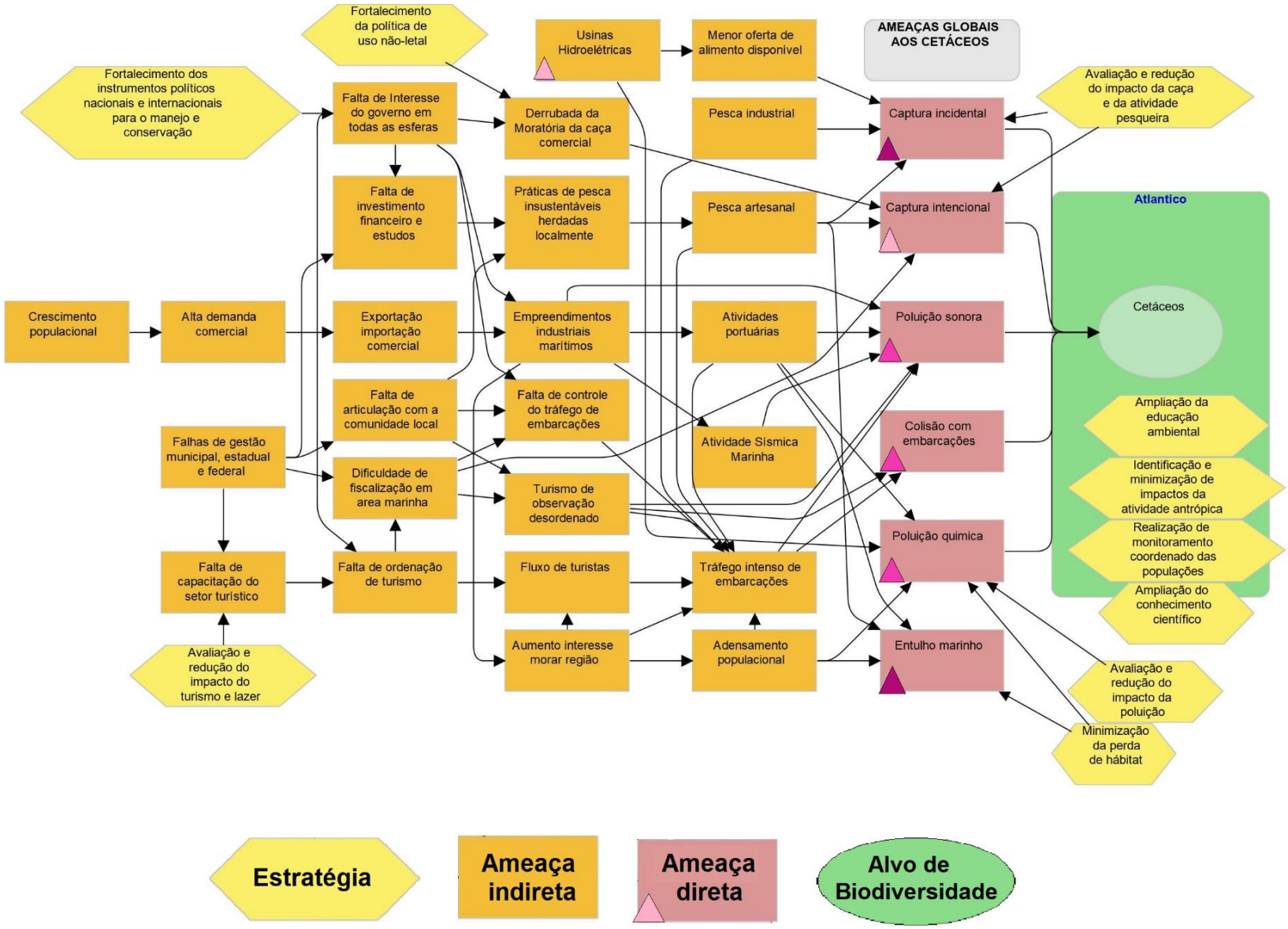

Fig IIc.1. Modelo conceitual prévio para Práticas de conservação de cetáceos elaborado no software Miradi 4.1.3, com as definições dos principais componentes: estratégia, ameaça direta, ameaça direta e alvo de biodiversidade. A intensidade de cor dos triângulos em cada ameaça direta representa a ordem de prioridade de ameaças de acordo com os resultados do capítulo 2.

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ANEXOS

Questionário 1

Questionnaire 1

EP1

We know your time is precious!
So that, you can stop and continue to respond our survey at any time.

To do so: Please go until the last page, and click "SUBMIT".
Your form will be saved, and a link will be sent to your email automatically.
Then, you just click on it and continue filling whenever you can.
*Obrigatório

1. Endereço de e-mail *

UESC Universidade Estadual de Santa Cruz

PPG Ecologia & Conservação Universidade Estadual de Santa Cruz

GEORGE MASON UNIVERSITY

Cetacean conservation in the Atlantic Ocean: collaboration networks, effectiveness, projects and actions

2. CONSENT: Mr (s) interviewed, please check the option that is in accordance with the following statement: "I was invited to participate in the present project, I have read the Informed Consent Form, all of my questions have been answered by the project staff, and I agree to participate in this study. I declare that if I check the option 'I agree', I will be giving my consent to participate in the project, as well as agreeing that the data obtained in the project be used for scientific purposes (i.e. dissemination in events and publications). I am aware that I will have access to a copy of this document. *

Marcar apenas uma oval.

I agree

INSTITUTIONAL INDICATORS

3. 1. Please define the mission/purpose of your institution or indicate the link (web site) to look upon:

4. 2. When was your institution founded?

5. 3. What is the total quantity of headquarters and the respective locations (please tell us the addresses):

6. 4. What are the ongoing fields of your institution? (please check all that apply)

Marque todas que se aplicam.

- [ ] Conduct own cetacean conservation research
- [ ] Campaigns (public)
- [ ] Outreach / education
- [ ] Take reaction teams
- [ ] Sponsor cetacean conservation research
- [ ] International treaties
- [ ] Lobbying (policy makers or Regulations managers)
- [ ] Create Laws/Legislation
- [ ] Develop Environmental Impact Assessment (EIA)
- [ ] Participate in Government issues
- [ ] Respond to stranded aquatic mammals
- [ ] Member of The National Oceanic and Atmospheric Administration (NOAA), Marine Mammal Health and Stranding Response Program
- [ ] Other

ENVIRONMENTAL INDICATORS

5. If you marked above "Conduct own cetacean conservation research" please mark the periodicity rate of it type of research below. (0-never; 1-rare; 2- occasional; 3-frequent; 4-every time).

7. Bioacoustics

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

8. Environmental education

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

9. Ethno conservation

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

10. Demographic parameters

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

11. Fishing interaction

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

12. Genetic

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

13. Health care

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

14. Histologic

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

15. Immunologic

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

16. Morphologic

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

17. Physiologic

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

18. Toxicological

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

19. Other:

6. Please select below the frequency scale the species have in the Institution's works.

where:

0- We never carry out works with the species
1- We rarely carry out works with the species
2- We occasionally carry out works with the species
3- We frequently carry out works with the species, but it is not our main focus of conservation
4 - We always carry out works with the species that is our main focus of conservation

20. Balaenoptera acutorostrata (Minke whale)

Marcar apenas uma oval.

0 1 2 3 4

21. Balaenoptera musculus (Blue Whale)

Marcar apenas uma oval.

0 1 2 3 4

22. Cephalorhynchus commersonii (Commerson's dolphin)

Marcar apenas uma oval.

0 1 2 3 4

23. Delphinus delphis (Short-beaked Common Dolphin)

Marcar apenas uma oval.

0 1 2 3 4

24. Eschrichtius robustus (Gray whale)

Marcar apenas uma oval.

0 1 2 3 4

25. Eubalaena australis (Righ whale)

Marcar apenas uma oval.

0 1 2 3 4

26. Globicephala macrorhynchus (Pilot Whale)

Marcar apenas uma oval.

0 1 2 3 4

27. Grampus griseus (Risso's Dolphin)

Marcar apenas uma oval.

0 1 2 3 4

28. Inia geoffrensis (Amazon River dolphin)

Marcar apenas uma oval.

0 1 2 3 4

29. Lagenorhynchus australis (Peale's Dolphin)

Marcar apenas uma oval.

0 1 2 3 4

30. Lagenorhynchus obliquidens (Pacific White-sided Dolphin)

Marcar apenas uma oval.

0 1 2 3 4

31. Lagenorhynchus obscurus (Dusky dolphin)

Marcar apenas uma oval.

0 1 2 3 4

32. Megaptera novaeangliae (Humpback whale)

Marcar apenas uma oval.

0 1 2 3 4

33. Orcinus orca (Orca)

Marcar apenas uma oval.

0 1 2 3 4

34. Phocoena sinus (Vaquita)

Marcar apenas uma oval.

0 1 2 3 4

35. Physeter macrocephalus (Sperm Whale)

Marcar apenas uma oval.

0 1 2 3 4

36. Pontoporia blainvillei (Franciscana dolphin)

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

37. Sotalia guianensis (Guiana dolphin)

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

38. Sotalia fluviatilis (Tucuxi)

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

39. Stenella frontalis (Atlantic Spotted Dolphin)

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

40. Stenella longirostris (Spinner dolphin)

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

41. Steno bredanensis (Rough-toothed dolphin)

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

42. Tursiops truncatus (Common Bottlenose dolphin)

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

43. Other

44. 7. Please respond if applicable:Your institution is active for the main focus species of conservation in scale. (Choose all that apply)

Marque todas que se aplicam.

- [ ] Local
- [ ] Regional
- [ ] National
- [ ] Global

45. 8. If you marked above “local scale”. Please check the existing threats on the institution’s geographic occupation area? (Choose all that apply)

Marque todas que se aplicam.

- [ ] Incidental capture
- [ ] Intended capture (whaling/hunting for direct consumption/oil use/skin use)
- [ ] Killing by resources competition
- [ ] Vessel collision
- [ ] Chemical pollution/organic waste
- [ ] Debris (e.g. plastic, abandoned fishing net)
- [ ] Noise pollution
- [ ] Construction of hydroelectric dams
- [ ] Other

46. 9. Have laws or regulations, aimed at cetacean conservation, been produced as the result of studies conducted at your institution? Which ones?

47. 10. Did your Institution have a direct influence on formulating these (aimed at cetacean conservation) cited laws or regulations? Which ones?

ECONOMIC INDICATORS

48. 11. What is the total annual income of your institution? (Please choose only the one that apply)

Marcar apenas uma oval.

- ◯ Zero
- ◯ Between $ 1 - 10.000
- ◯ Between $ 10.000 - 100.000
- ◯ Between $ 100.000 - 500.000
- ◯ Between $ 500.000 – 1 million
- ◯ Between $ 1 million – 5 million
- ◯ More than $ 5 million

49. 12. This current annual income, compared to 5 years ago is: (choose only the one that apply)

where: 0 - Very less; 1 - Somewhat less; 2 - The same; 3 - Somewhat bigger; 4 - To much bigger

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

50. 13. What percentage (%) of your funds do you put towards research on cetacean conservation?

51. 14. What percentage (%) of this cetacean conservation funds you put towards: 1-Human resources/salaries; 2-Research/direct actions; 3-Social/community aspects of aquatic conservation (e.g. riverside community; productive groups; shell fishermen). Please tell us the % for each of the three mentioned sectors.

52. 15. What is the total current Institution team member average?

Please, tell us the current team member average for each position: Board of Directors; Secretary; Media; Administration; Environmental Education Board; Research Board; Trainees (Internship); Unpaid volunteers; Outsourced area; Other.

53. 16. This current annual team member average, compared to 5 years ago is: (Please choose only the one that apply where: 0 - Very less; 1 - Somewhat less; 2 - The same; 3 - Somewhat bigger; 4 - To much bigger)

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

54. 17. Do you conduct any cetacean related activities where proceeds go back into your Institution? (please check all that apply)

Marque todas que se aplicam.

- ☐ Whale-watching
- ☐ Selling cetacean souvenirs
- ☐ Adopt a whale
- ☐ Other

55. 18. Does your Institution have ongoing partnerships (i.e., data exchange for research/ event organization/ research paper collaboration) with other Institutions? Please, choose all the Institutions below that apply.

Marque todas que se aplicam.

- [ ] Fundación AquaMarina (Argentina)
- [ ] Fundación Cethus (Argentina)
- [ ] Fundación Marybio (Argentina)
- [ ] Fundación Patagonia Natural (Argentina)
- [ ] Fundación Tierra Salvaje (Argentina)
- [ ] Fundacion Vida Silvestre (Argentina)
- [ ] Instituto de Conservación de Ballenas (Argentina)
- [ ] Punta Norte Orca Research (Argentina)
- [ ] Aquasis (Brazil)
- [ ] Projeto mamíferos aquáticos da Amazônia (Brazil)
- [ ] Associação MarBrasil (Brazil)
- [ ] Centro Mamíferos Aquáticos (Brazil)
- [ ] Fundação Mamíferos Aquáticos (Brazil)
- [ ] Instituto Aqualie (Brazil)
- [ ] Instituto Argonauta (Brazil)
- [ ] Instituto Australis / Projeto Baleia Franca (Brazil)
- [ ] Instituto Baleia Franca (Brazil)
- [ ] Instituto Baleia Jubarte (Brazil)
- [ ] Instituto Biopesca (Brazil)
- [ ] Instituto Boto-cinza (Brazil)
- [ ] Instituto de Desenvolvimento Sustentável Mamirauá (Brazil)
- [ ] Instituto de Pesquisas Cananéia (Brazil)
- [ ] Instituto Mamíferos Aquáticos (Brazil)
- [ ] Instituto Orca (Brazil)
- [ ] Projeto Atlantis (Brazil)
- [ ] Projeto Baleia à Vista (Brazil)
- [ ] Projeto Cetáceos da Costa Branca (Brazil)
- [ ] Projeto Golfinho Rotador (Brazil)
- [ ] Projeto Ilhas do Rio (Brazil)
- [ ] Projeto Toninhas (Brazil)
- [ ] VIVA Baleias, Golfinhos e cia (Brazil)
- [ ] Grupo de Estudos de Mamíferos Aquáticos da Amazônia (Brazil)
- [ ] Grupo de Estudos de Mamíferos Aquáticos do Rio Grande do Sul (Brazil)
- [ ] Grupo de Estudos de Mamíferos Marinhos da Região dos Lagos (Brazil)
- [ ] Bluevoice (USA)
- [ ] Center for Coastal Studies (USA)
- [ ] Cetacean Society International (USA)
- [ ] Humane Society of the US (USA)
- [ ] International Fund for Animal Welfare (USA)
- [ ] Marine Mammal Commission (USA)
- [ ] National Oceanic and Atmospheric Administration (USA)
- [ ] Natural Resources Defense Council (USA)
- [ ] Oceana (USA)
- [ ] Outer Banks Center for Dolphin Research (USA)
- [ ] The dolphin ecology project (USA)
- [ ] The Nature Conservancy (USA)
- [ ] The Wildlife Society (USA)
- [ ] Tropical Dolphin Research Foundation (USA)
- [ ] Whale and Dolphin Conservation (USA)
- [ ] Whale Center of New England (USA)
- [ ] Wildlife Conservation Society (USA)
- [ ] World Resources Institute (USA)
- [ ] World Wildlife Fund (USA)
- [ ] Cedar Key dolphin project (USA)
- [ ] Conservation International (USA)
- [ ] Defenders of Wildlfe (USA)
- [ ] Ocean Alliance (USA)
- [ ] The Ocean Foundation (USA)
- [ ] The Society for Marine Mammalogy (USA)
- [ ] The Ocean Conservancy (USA)
- [ ] Sarasota dolphin project (USA)
- [ ] Organización Conservación Cetáceos (Uruguay)

56. 19. Is there any Institution (USA) that works on cetacean conservation that is not in the above list what would you like to mention?

57. 20. Overall, which circumstances are required for establishing these partnerships with your Institution?

58. 21. If apply, could you please briefly state in which circumstances your Institution could never partnered?

22. What are the primary difficulties during action execution of you institution? (all related to cetacean conservation)

Please select a score (from extremely easy to extremely hard) that best describes your opinion.
Where:
0 - Extremely easy
1- Easy
2 - Moderate
3 - Hard
4 - Extremely hard

59. Fund-raising

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

60. Human resources

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

61. Political influence: Local government

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

62. Political influence: State government

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

63. Political influence: Federal government

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

64. Links with local community

Marcar apenas uma oval.

0 1 2 3 4

65. Links with partners

Marcar apenas uma oval.

0 1 2 3 4

66. Conflicts on economic interests

Marcar apenas uma oval.

0 1 2 3 4

67. 23. Please describe the general difficulties in enacting cetacean conservation in your country (please only answer if applicable).

68. 24. Please, mark below if your institution team attends any scientific meetings in the last 5 years (the options match the name of meeting followed by holder/sponsor).

Marque todas que se aplicam.

- [ ] Meeting of the Parties to ASCOBANS - Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas
- [ ] Conference of the Parties to CBD - Convention on Biological Diversity
- [ ] Conference of the Parties to CITES - Convention on International Trade in Endangered Species of Wild Fauna and Flora
- [ ] Conference of the Parties to CMS - Convention on the Conservation of Migratory Species of Wild Animals
- [ ] Annual conference of ESC - European Cetacean Society
- [ ] Encontro Nacional sobre Conservação e Pesquisa de Mamíferos Aquáticos (ENCOPEMAQ, Brasil)
- [ ] Meeting of the IPBES - Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
- [ ] IUCN World Conservation Congress - International Union for Conservation of Nature
- [ ] Commission meeting forum - International Whaling Commission
- [ ] Scientific Committee (SC) meeting forum - International Whaling Commission
- [ ] Conservation Committee (CC) meeting forum - International Whaling Commission
- [ ] Meeting of States Parties to UNCLOS - United Nations Convention on the Law of the Sea
- [ ] International Congress for Conservation Biology (ICCB) - Society for Conservation Biology (SCB)
- [ ] International Marine Conservation Congress (IMCC) - Society for Conservation Biology (SCB)
- [ ] World Marine Mammal Science Conference - Society for Marine Mammalogy
- [ ] World Whale Conference - World Cetacean Alliance
- [ ] Reunión de Trabajo de Expertos en Mamíferos Acuáticos y Congreso de la SOLAMAC - Sociedad Latinoamericana de Especialistas en Mamíferos Acuáticos

69. Other meeting related to cetacean conservation you want to mention:

70. 25. How many research studies have been published by your institution (aimed at cetacean conservation)? Please tell us the total number of: Books; Book chapters; Scientific papers OR, if preferable, please tell us, instead, the Web site where this information is listed.

26. Please select below the frequency scale the communication means are employed for cetacean conservation at your institution.

Where:
0-Never
1-Rarely
2-Occasionaly
3-frequently
4-Every time

71. Own Website

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

72. Own Social media

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

73. Internal talks

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

74. Internal Newspapers/printed magazines

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

75. News in other websites

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

76. Radio interviews

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

77. Television interviews

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

78. External Talks

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

79. External newspapers / printed magazines

Marcar apenas uma oval.

0	1	2	3	4
◯	◯	◯	◯	◯

80. Other

Dear participant, thank you very much for your collaboration!

We truly appreciate the time you dedicated to our survey. Please, feel free to contact us if you have any doubts. We will be back soon with our results. We kindly ask you please not to disclose the information contained in the questions of this survey until our results have been published. Have a fantastic day!

Questionário 2 (exemplo)

Questionnaire 2 (sample)

In this questionnaire we will mention ***N*** actions that are in the National action plan for aquatic mammals conservation aimed at large cetaceans and pinniped (Claudia C. Rocha-Campos et al. Brasília: Chico Mendes Biodiversity Conservation Institute, ICMBio, 2011), the small cetacean Franciscana: *Pontoporia blainvillei* (Ana Paula Madeira Di Beneditt et al. – Brasília: Chico Mendes Biodiversity Conservation Institute, ICMBio, 2010), or small cetaceans (Rocha-Campos et al. Brasília: Chico Mendes Biodiversity Conservation Institute, ICMBio, 2010) aimed at *species*, and we ask you to choose the best option about the activities carried out by your Conservation Organization.

2.1. Please read and check each listed action bellow according to the following abbreviations:

0 - We never started this action;
1 - We started this action and it is in early stage
2 - We started this action and it is in intermediary stage
3 - We started this action and it is nearing completion
4 - We conducted the action and it is totally completed
(*Reader, please see actions per species bellow*)

2.2. Are there any actions performed by your institution that were not cited here? If if applicable please describe them.

2.3. Does the institution measure the success of the actions carried out, do you have your own indicators of success?

2.4. Lastly: What cetaceans' conservation efficacy means for you?

*Nota do autor: As ações relacionadas a espécie alvo principal de conservação da instituição do entrevistado eram apresentadas em Português ou Inglês, de acordo com sua nacionalidade. Abaixo deixamos em Inglês as ações que foram respondidas por ao menos uma Instituição estrangeira:

Eubalaena australis

1 - Refine the priority areas for species conservation

2 - Propose critical areas for create protected areas

3 - Investigate the impact of different anthropic noises

4 - Conduct studies on the effects of oil and gas exploration activities

5 - Implement a collision avoidance system by warning the presence of whales in main navigation routes

6 - Assess and monitor the impact of fisheries interactions

7 - Articulate with government to the management of fishing activities that cause negative impacts to the species

8 - Plan the inspection of whale-watching activities

9 - Plan the supervision of fishing activities for critical areas for the species

10 - Determine levels of contaminants in free-range whales

11 - Improve the planning of whale-watching tourism

12 - Identify and monitor the impact of whale-watching tourism in protected areas

13 - Articulate the publication of legal instruments to ensure the use of information regarding areas and periods of restriction in the licensing of oil and gas exploration (including seismic surveys, prospecting, drilling, production and transportation)

14 - Promote debate on non-lethal use policy with the scientific community at events

15 - Promote a forum for coordinate of monitoring actions involving countries with common individuals

16 - Estimate abundance and population trend

17 - Estimate demographic parameters, including unnatural mortality

18 - Increase the knowledge about movements, migratory routes and feeding areas

19 - Verify the influence of environmental factors on the population dynamics, in the areas of feeding and reproduction of the species

Inia geoffrensis* e *Sotalia fluvuatillis

1 - Avaliar e monitorar o impacto da captura intencional e acidental das espécies de pequenos cetáceos fluviais

2 - Criar e implementar um Plano de Fiscalização para o combate à captura direcionada do boto-cor-de-rosa (*Inia geoffrensis*) (IND - Plano de Fiscalização implementado)

3 - Avaliar e monitorar o uso de botos (*Inia geoffrensis* e *Sotalia fluviatilis*) como isca na pesca da piracatinga (*Callophypus macropterus*)

4 - Testar novas iscas e atrativos para uso alternativo na pesca da piracatinga (*Callophypus macropterus*)

5 - Avaliar o uso de produtos e subprodutos de pequenos cetáceos fluviais e costeiros

6 - Identificar e quantificar os compostos poluentes emergentes nas espécies de pequenos cetáceos

7 - Quantificar a magnitude das concentrações dos micropoluentes e seus efeitos (sistema endócrino e patologias associadas) sobre os pequenos cetáceos fluviais

8 - Caracterizar e quantificar o impacto acústico de atividades antrópicas potencialmente poluidoras sobre as espécies fluviais de pequenos cetáceos

9 - Mapear, avaliar e monitorar o impacto do turismo sobre populações residentes de *Inia geoffrensis* e *Sotalia fluviatilis*

10 - Avaliar e propor medidas de ordenamento das atividades de nado, alimentação assistida e terapia existentes com *Inia geoffrensis* na Amazônia

11 - Elaborar mapas de sensibilidade para as áreas de ocorrência de pequenos cetáceos costeiros e fluviais

12 - Elaborar um protocolo para avaliação e monitoramento dos impactos dos empreendimentos / atividades sobre pequenos cetáceos localizados no ambiente fluvial

13 - Identificar os estoques de *Inia geoffrensis*

14 - Identificar os estoques de *Sotalia fluviatilis*

15 - Investigar os parâmetros de história de vida de *Inia geoffrensis*

16 - Investigar os parâmetros de história de vida de *Sotalia fluviatilis*

17 - Estimar a abundância e a tendência populacional de *Inia geoffrensis* nas diferentes bacias

18 - Estimar a abundância e a tendência populacional de *Sotalia fluviatilis* nas diferentes bacias

19 - Rever a categoria de conservação, especialmente de *Inia geoffrensis, Sotalia fluviatilis, Sotalia guianensis, Orcinus orca, Steno bredanensis, Tursiops truncatus*

20 - Avaliar o estado de saúde das populações de *Inia geoffrensis, Sotalia fluviatilis, Sotalia guianensis, Orcinus orca, Steno bredanensis, Tursiops truncatus*

21 - Avaliar e monitorar a emergência de doenças de pele em populações de *Sotalia guianensis, Tursiops truncatus, Inia geoffrensis, Sotalia fluviatilis e Stenella longirostris*

22 - Elaborar e testar tecnologias que reduzam a captura acidental de pequenos cetáceos

23 - Identificar áreas e épocas de maior ocorrência de capturas acidentais de pequenos cetáceos para as áreas críticas no Norte e Nordeste do Brasil

24 - Investigar os padrões acústicos dos pequenos cetáceos

25 - Elaborar campanhas de mídia para a divulgação da necessidade de conservação de pequenos cetáceos

26 - Elaborar um plano de educação ambiental para *Sotalia fluviatilis e Inia geoffrensis*

27 - Buscar apoio para a realização de reuniões científicas periódicas sobre pesquisa e conservação de pequenos cetáceos sob ameaça antrópica

28 - Articular junto ao órgão competente para a criação de áreas marinhas protegidas para a conservação de pequenos cetáceos

29 - Articular a incorporação de protocolos de avaliação e monitoramento de impacto dos empreendimentos/atividades nas zonas de ocorrência de pequenos cetáceos junto às instituições licenciadoras

30 - Articular a criação de áreas de exclusão de pesca e outras medidas de ordenação visando evitar capturas incidentais

31 - Criar e implementar um Plano de Fiscalização para o combate à comercialização de subprodutos de pequenos cetáceos

32 - Elaborar protocolo sobre diagnóstico e tratamento de pequenos cetáceos acometidos por enfermidades dermatológicas

33 - Articular a inclusão de informações de mortalidade incidental e acidental em atividades pesqueiras nos questionários de desembarque

34 - Recomendar o controle de comércio estadual e internacional da piracatinga (impostos, taxas, etc.) à Policia Federal, Receita Estadual e Federal, MRE, Câmara de Comércio Exterior

Megaptera novaeangliae

1 - Refinar as áreas prioritárias para a conservação da espécie

2 - Propor áreas críticas para a criação de áreas protegidas

3 - Investigar o impacto de diferentes fontes sonoras de origem antrópica

4 - Realizar estudos sobre os efeitos das atividades de exploração e produção de petróleo e gás

5 - Implantar um sistema de prevenção de colisão por meio do aviso de presença de baleias nas principais rotas de navegação

6 - Avaliar e monitorar o impacto da interação com a pesca

7 - Fazer gestão junto ao Ministério da Pesca para o ordenamento das atividades pesqueiras que causam impactos negativos à espécie

8 - Direcionar a fiscalização das atividades de turismo embarcado de observação da espécie

9 - Direcionar a fiscalização das atividades pesqueiras para áreas e períodos críticos para a espécie

10 - Determinar os níveis de contaminantes nas baleias-jubarte

11 - Aprimorar o ordenamento do turismo de observação de baleias (articular a revisão da Portaria IBAMA 117

12 - Articular a publicação de instrumentos legais para garantir a utilização das informações referentes a áreas e períodos de restrição no licenciamento exploração de gás e petróleo (incluindo pesquisas sísmicas, prospecção, perfuração, produção e transporte)

13 - Promover o debate sobre a política de uso não-letal com a comunidade científica em eventos

14 - Promover um fórum para a coordenação das ações de monitoramento

15 - Estimar a abundância e a tendência populacional

16 - Estimar os parâmetros demográficos, incluindo a mortalidade não-natural

17 - Verificar a existência de unidades discretas de manejo (existência de populações e subpopulações)

18 - Ampliar o conhecimento sobre os movimentos, as rotas migratórias e as áreas de alimentação

19 - Verificar a influência de fatores ambientais na dinâmica populacional, nas áreas de alimentação e de reprodução da espécie

Orcinus orca

1 - Assess and monitor the impact of bycatch on small cetacean species

2 - Assessing and monitoring the impact of longline fisheries on small oceanic cetaceans

3 - Identify and quantify emerging pollutants in small cetacean species

4 - Quantify the magnitude of micro pollutants concentrations and their effects - at endocrine system and associated pathologies - on small cetaceans, especially *Sotalia guianensis, Steno bredanensis, Orcinus orca, Pseudorca crassidens and Tursiops truncatus*

5 - To characterize and quantify the acoustic impact of anthropic activities on the species of small oceanic cetaceans

6 - Develop sensitivity maps aimed at the occurrence areas of small oceanic cetaceans

7 - Elaborate a protocol for evaluate and monitoring of the impacts of the ventures on ocean environment on small cetaceans

8 - Investigate the distribution patterns of *Orcinus orca*

9 - Identify stocks and verify the existence of *Orcinus orca* ecotypes

10 - Estimating the abundance of small oceanic cetaceans

11 - Review the conservation category, especially of *Inia geoffrensis, Sotalia fluviatilis, Sotalia guianensis, Orcinus orca, Steno bredanensis, Tursiops truncatus*

12 - To evaluate the health status of *Inia geoffrensis, Sotalia fluviatilis, Sotalia guianensis, Orcinus orca, Steno bredanensis, Tursiops truncatus*

13 - Develop and test technologies to reduce bycatch of small cetaceans

14 - Investigate acoustic patterns of small cetaceans 15 - Elaborate media campaigns aimed at the conservation of small cetaceans

16 - To seek support for the holding scientific meetings on research and conservation of small cetaceans

17 - Articulate for create protected marine areas aimed at the conservation of small cetaceans

18 - Articulate to incorporate protocols of assessment and monitoring aimed at the impact of the coastal and offshore human activities on small cetaceans

19 - Articulate the creation of no-fishing areas and other management actions to avoid by-catch

20 - Elaborate protocol on diagnosis and treatment of small cetaceans affected by dermatological diseases

21 - Articulate the inclusion of bycatch information in fishing activities in the landing questionnaires

Pontoporia blainvillei

1 - Carry out a survey of fishing communities and characterization of fishing fleet

2 - Carry out fishing fleet monitoring to obtain estimates of Franciscana bycatch

3 - Identify the areas of greatest risk of Franciscana bycatch

4 - Carry out aerial surveys to determine estimate the Franciscana abundance

5 - Technically define the ideal size of fishing nets

6 - Establish gillnet exclusion areas

7 - Elaborate a protocol for impact assessment and monitoring of coastal ventures

8 - Articulate the incorporation of protocols of assessment and monitoring aimed at the impact of coastal and offshore human activities

9 - Map the areas of restriction / exclusion of activities / ventures that cause significant environmental impact in areas of Franciscana occurrence

10 - Transform mapping of exclusion areas into normative act

11 - Ensure that the licensing process includes compensatory and mitigating actions, of entrepreneur's responsibility, that guarantee the conservation of impacted *Pontoporia blainvillei* populations in each of their management areas

12 - Create a visual identity for Franciscana by advertising people

13 - Produce a video documentary of Franciscana

14 - Preparing and disseminating posters, leaflets and books related to the Franciscanas bioology and conservation

15 - Articulate with the Ministry of Education aimed at the inclusion of topics related to the biology and conservation of Franciscana in textbooks

16 - Promote the inclusion of Franciscana in textbooks

17 - Promote the insertion of Franciscana in the national media

18 - Acting with companies to make products with the image of Franciscana (eg stamps and phone cards)

19 - Develop an Environmental Education program on the conservation of Franciscanas for fishermen and coastal communities

20 - Look for support for the holding of periodic scientific meetings on Franciscana research and conservation

21 - Determine the age and sexual range of the part of the population caught in fishing activities

22 - Analyze parasite fauna

23 - Conduct studies on ethnotaxonomy and ethnoecology

24 - Identify emerging pollutants

25 - Quantify the magnitude of micropollutants concentrations and their effects on the immune and reproductive system

26 - Carry out studies on food ecology and its spatio-temporal variation

27 - Refine estimates of reproductive parameters (e.g., age at first maturity and fecundity)

28 - Characterize the acoustic repertoire of the species and the effects of noise pollution

29 - Characterize living area, displacement patterns and level of residence

30 - Define the degree of population genetic isolation or differentiation

31 - To test technological and / or operational alternatives to reduce Franciscana bycatch

Sotalia guianensis

1 - Avaliar e monitorar o impacto da pesca de emalhe sobre as espécies costeiras, com ênfase em *Sotalia guianensis*

2 - Avaliar o uso de produtos e subprodutos de pequenos cetáceos fluviais e costeiros

3 - Identificar e quantificar os compostos poluentes emergentes nas espécies de pequenos cetáceos

4 - Quantificar a magnitude das concentrações dos micropoluentes e seus efeitos (sistema endócrino e patologias associadas) sobre os pequenos cetáceos, especialmente *Sotalia guianensis*

5 - Monitorar parâmetros de saúde (hormonais, bioquímicos) em relação aos níveis de poluentes em populações de *Sotalia guianensis* nas regiões Sudeste e Sul do Brasil

6 - Caracterizar e quantificar o impacto acústico de empreendimentos e atividades antrópicas sobre as espécies de pequenos cetáceos costeiros

7 - Mapear, avaliar e monitorar o impacto do turismo sobre populações residentes de *Sotalia guianensis*

8 - Elaborar mapas de sensibilidade para as áreas de ocorrência de pequenos cetáceos costeiros e fluviais

9 - Elaborar um protocolo para avaliação e monitoramento dos impactos dos empreendimentos/ atividades localizadas no ambiente costeiro sobre pequenos cetáceos

10 - Investigar deslocamentos e uso de área de populações residentes de *Sotalia guianensis*

11 - Proposta de unidades de manejo de *Sotalia guianensis*

12 - Investigar os parâmetros de história de vida de *Sotalia guianensis*

13 - Estimar a abundância e a tendência das populações residentes de *Sotalia guianensis*

14 - Rever a categoria de conservação, especialmente de *Sotalia guianensis*

15 - Avaliar o estado de saúde das populações de *Sotalia guianensis*

16 - Avaliar e monitorar a emergência de doenças de pele em populações de *Sotalia guianensis*

17 - Elaborar e testar tecnologias que reduzam a captura acidental de pequenos cetáceos

18 - Identificar áreas e épocas de maior ocorrência de capturas acidentais de pequenos cetáceos para as áreas críticas no Norte e Nordeste do Brasil

19 - Verificar a variabilidade comportamental de populações residentes de *Sotalia guianensis*

20 - Investigar os efeitos de ações antrópicas sobre o comportamento de *Sotalia guianensis*

21 - Investigar os padrões acústicos dos pequenos cetáceos

22 - Elaborar campanhas de mídia para a divulgação da necessidade de conservação de pequenos cetáceos

23 - Elaborar um plano de educação ambiental para *Sotalia guianensis* na costa norte do Brasil

24 - Elaborar um plano de educação ambiental para *Sotalia guianensis* na costa nordeste do Brasil

25 - Elaborar um plano de educação ambiental para *Sotalia guianensis* no sul e sudeste do Brasil

26 - Buscar apoio para a realização de reuniões científicas periódicas sobre pesquisa e conservação de pequenos cetáceos sob ameaça antrópica

27 - Articular junto ao órgão competente para a criação de áreas marinhas protegidas para a conservação de pequenos cetáceos

28 - Articular a incorporação de protocolos de avaliação e monitoramento de impacto dos empreendimentos/atividades nas zonas de ocorrência de pequenos cetáceos junto às instituições licenciadoras

29 - Articular a criação de áreas de exclusão de pesca e outras medidas de ordenação visando evitar capturas incidentais

30 - Criar e implementar um Plano de Fiscalização para o combate à comercialização de subprodutos de pequenos cetáceos

31 - Elaborar protocolo sobre diagnóstico e tratamento de pequenos cetáceos acometidos por enfermidades dermatológicas

32 - Articular a inclusão de informações de mortalidade incidental e acidental em atividades pesqueiras nos questionários de desembarque

33 - Atuar junto ao MMA e ao ICMBio para a criação da Reserva de Fauna da Baía da Babitonga (SC)

34 - Articular junto ao ICMBio a criação de uma unidade de conservação Marinha Federal na Baía de Ilha Grande (RJ)

35 - Articular junto ao ICMBio a criação de uma unidade de conservação Marinha Federal na Baía de Sepetiba (RJ)

36 - Articular junto ao ICMBio a criação de uma unidade de conservação Federal de uso sustentável no município de Tibau do Sul (RN)

Stenella longirostris

1 - Avaliar e monitorar o impacto da pesca de emalhe sobre as espécies de pequenos cetáceos oceânicos

2 - Identificar e quantificar os compostos poluentes emergentes nas espécies de pequenos cetáceos

3 - Caracterizar e quantificar o impacto acústico de empreendimentos e atividades antrópicas sobre as espécies de pequenos cetáceos oceânicos

4 - Avaliar e monitorar o impacto do turismo sobre *Stenella longirostris* em Fernando de Noronha

5 - Elaborar mapas de sensibilidade para as áreas de ocorrência de pequenos cetáceos oceânicos

6 - Elaborar um protocolo para avaliação e monitoramento dos impactos dos empreendimentos/ atividades localizadas no ambiente oceânico sobre pequenos cetáceos

7 - Investigar os padrões de distribuição de populações residentes *Stenella longirostris*

8 - Investigar os parâmetros de história de vida de *Stenella longirostris*

9 - Estimar a abundância de pequenos cetáceos oceânicos

10 - Estimar a abundância de *Stenella longirostris* em Fernando de Noronha

11 - Avaliar e monitorar a emergência de doenças de pele em populações de *Stenella longirostris*

12 - Elaborar e testar tecnologias que reduzam a captura acidental de pequenos cetáceos

13 - Investigar os efeitos de ações antrópicas sobre o comportamento de *Stenella longirostris* em Fernando de Noronha

14 - Investigar os padrões acústicos dos pequenos cetáceos

15 - Elaborar campanhas de mídia para a divulgação da necessidade de conservação de pequenos cetáceos

16 - Buscar apoio para a realização de reuniões científicas periódicas sobre pesquisa e conservação de pequenos cetáceos sob ameaça antrópica

17 - Articular junto ao órgao competente para a criação de áreas marinhas protegidas para a conservação de pequenos cetáceos

18 - Articular a incorporação de protocolos de avaliação e monitoramento de impacto dos empreendimentos/atividades nas zonas de ocorrência de pequenos cetáceos junto às instituições licenciadoras

19 - Articular a criação de áreas de exclusão de pesca e outras medidas de ordenação visando evitar capturas incidentais

20 - Criar e implementar um Plano de Fiscalização para o combate à comercialização de subprodutos de pequenos cetáceos

21 - Elaborar protocolo sobre diagnóstico e tratamento de pequenos cetáceos acometidos por enfermidades dermatológicas

22 - Articular a inclusão de informações de mortalidade incidental e acidental em atividades pesqueiras nos questionários de desembarque

23 - Articular junto ao MPA para a criação de áreas de exclusão de pesca nos montes submarinos da cadeia Fernando de Noronha

24 - Articular junto ao ICMBio restrição de acesso da região Entre Ilhas (Parnamar-FN) ao tráfego de embarcações

Tursiops truncatus

1 - Assess and monitor the impact of bycatch on *Tursiops truncatus*

2 - Evaluate the use of products and by-products of *Tursiops truncatus*

3 - Identify and quantify emerging pollutants in *Tursiops truncatus*

4 - Quantify the magnitude of micropollutants concentrations and their effects (endocrine system and associated pathologies) on *Tursiops truncatus*

5 - To characterize and quantify the acoustic impact of anthropic activities on *Tursiops truncatus*

6 - Map, evaluate and monitor the impact of tourism on resident populations of *Tursiops truncatus*

7 - Develop sensitivity maps aimed at the occurrence areas of small coastal cetaceans

8 - Elaborate a protocol for evaluate and monitoring of the impacts of the coastal ventures on small cetaceans

9 - Investigate the distribution patterns of *Tursiops truncatus*

10 - Investigate displacements and use of area of resident populations of *Tursiops truncatus*

11 - Define taxonomic status of the genus Tursiops

12 - Identify stocks of *Tursiops truncatus*

13 - Investigate the life history parameters of *Tursiops sp.*

14 - To estimate the abundance and population trend of *Tursiops sp.*

15 - Review the *Tursiops truncatus*' category of conservation

16 - Evaluate the state of health of the populations of *Tursiops truncatus*

17 - Evaluate and monitor the emergence of skin diseases in populations of *Tursiops truncatus*

18 - Develop and test technologies to reduce bycatch of small cetaceans

19 - Verify the behavioral variability of resident populations of *Tursiops sp.*

20 - Investigate the effects of anthropic actions on the behavior of *Tursiops sp.*

21 - Investigate acoustic patterns of small cetaceans

22 - Elaborate media campaigns aimed at the conservation of small cetaceans

23 - Elaborate an environmental education plan aimed at the conservation of *Tursiops truncatus*

24 - To seek support for the holding scientific meetings on research and conservation of small cetaceans

25 - Articulate for create protected marine areas aimed at the conservation of small cetaceans

26 - Articulate the incorporation of protocols of assessment and monitoring aimed at the impact of the coastal and offshore human activities on small cetaceans

27 - Articulate to the creation of no-fishing areas and other management actions to avoid by-catch

28 - Create and implement a Surveillance Plan to combat the marketing of by-products of small cetaceans

29 - Elaborate protocol on diagnosis and treatment of small cetaceans affected by dermatological diseases

30 - Articulate the inclusion of bycatch information in fishing activities in the landing questionnaires

Informed Consent Purpose

Informed Consent Purpose

ASSESSMENT OF INSTITUTIONS' EFFECTIVENESS FOR MARINE CETACEAN CONSERVATION IN THE ATLANTIC OCEAN

PROJECT PROCEDURES

This project is being conducted to a doctoral thesis entitled: Assessment of Institutions' effectiveness for marine cetacean conservation in the Atlantic Ocean.

Due to the vulnerability and exposure of cetaceans to anthropogenic threats, studies related to conservation strategies for these animals are necessary. The objective of the present project is to evaluate the effectiveness of institutions dedicated to the conservation of marine cetaceans in United States of America.

If you agree to participate, you will be asked to respond to an online form that takes around an hour to be completely answered. This form can be paused and resumed at any time until its complete completion.

If you decide not to participate in the study, or resolve at any time to give up, you will not suffer any prejudice and may do so even after you have signed this term or participated in the collection of data.

The dissemination of the results of the project will be carried out anonymously and will guarantee the integrity of the participant.

RISKS

There are no foreseeable risks for participating in this project. But this project may possibly generate some type of discomfort or embarrassment in the identification of failures in the execution of conservation actions. To avoid and reduce any discomfort, we will keep the personal data collected confidential and preserve the privacy of the participants.

BENEFITS

There are no direct benefits to the participants. However, as we will provide the feedback of our results, the indirect benefits to the institutions interviewed (subjects) will include: be able to identify potential gaps that make these institutions fail in their conservation objectives and learn best ways for effective conservation. The same indirect benefits cited above are beneficial to other institutions not investigated here. In addition, as this project will bring learning from different social contexts, it will contribute to society and general knowledge with new conceptions on cetacean conservation.

CONFIDENTIALITY

The data in this study will be confidential and the names of the institutions will me changed for codes. For coded identifiable data the participant's name will not be included on the surveys and other collected data; the use of a code will be placed on the institutions names. The researcher will be able to link the participant's survey responses to the participant's identity through the use of an identification key and will be the only one to have access to the identification key. Identifiers may be removed from the data and the de-identified data could be used for future project without additional consent from participants.

Once this project involves electronic collection of data by google forms, while it is understood

that no computer transmission can be perfectly secure, reasonable efforts will be made to protect the confidentiality of your transmission.

PARTICIPATION

Your participation is voluntary, and you may withdraw from the study at any time and for any reason. If you decide not to participate or if you withdraw from the study, there is no penalty or loss of benefits to which you are otherwise entitled. There are no costs to you or any other party (if there are costs, replace this statement with a description of the costs for participating in the project). We also guarantee that this project does not represent any form of expense, nor remuneration to the participants and even if not foreseen, if you have expenses arising from the project, you will be reimbursed. We guarantee the right to indemnity if the participant has any damage resulting from their participation in the project.

CONTACT

This project is being conducted by Marcela Marega Imamura, short-term researcher at Environmental Science and Policy department at George Mason University – Fairfax/VA, under advise of Dr. Alonso Aguirre. She may be reached at _____, you can also contact her advisor: Dr. Alonso Aguirre: _____ for any pertinent questions or to report a project-related problem

I will be at your disposal for any clarification and follow-up that you deem necessary at any stage of the project. A copy of this consent form will be send to you, also can be downloaded online. You may contact the George Mason University Institutional Review Board office at 703-993-4121 if you have questions or comments regarding your rights as a participant in the project.

This project has been reviewed according to George Mason University procedures governing your participation in this project.

CONSENT

Mr (s) interviewed, please tick the option that is in accordance with the following statement:
“I was invited to participate in the present project, I have read this form, all of my questions have been answered by the project staff, and I agree to participate in this study. I declare that if I check the option "I agree to participate in the project "I will be giving my consent to participate in the project, as well as agreeing that the data obtained in the project be used for scientific purposes (i.e. dissemination in events and publications). I am aware that I will have access to a copy of this document.

Autorização do Comitê de Revisão da George Mason University

Office of Research Development, Integrity, and Assurance

Research Hall, 4400 University Drive, MS 6D5, Fairfax, Virginia 22030
Phone: 703-993-5445; Fax: 703-993-9590

DATE:	April 5, 2019
TO:	Alonso Aguirre, Phd
FROM:	George Mason University IRB
Project Title:	[1421507-1] Assessment of Institutions' effectiveness for marine cetacean conservation in the Atlantic Ocean
SUBMISSION TYPE:	New Project
ACTION:	DETERMINATION OF NOT HUMAN SUBJECT RESEARCH
DECISION DATE:	April 5, 2019

Thank you for your submission of New Project materials for this project. The Institutional Review Board (IRB) Office has determined this project does not meet the definition of human subject research under the purview of the IRB according to federal regulations.

Please remember that if you modify this project to include human subjects research activities, you are required to submit revisions to the IRB prior to initiation.

If you have any questions, please contact Kim Paul at (703) 993-4208 or kpaul4@gmu.edu. Please include your project title and reference number in all correspondence with this committee.

Please note that department or other approvals may be required to conduct your research.

GMU IRB Standard Operating Procedures can be found here: https://rdia.gmu.edu/topics-of-interest/human-or-animal-subjects/human-subjects/human-subjects-sops/

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within George Mason University IRB's records.

Termo de consentimento livre e esclarecido

TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO – TCLE BASEADO NAS DIRETRIZES CONTIDAS NA RESOLUÇÃO CNS 466/2012.

Prezado (a) Senhor (a), esta pesquisa é sobre o projeto de doutorado com o título: **Avaliação da eficácia de Instituições voltadas à conservação de cetáceos marinhos no Atlântico.** Sendo desenvolvida por **Marcela Marega**
Imamura, aluna do PPG em Ecologia e Conservação da biodiversidade da Universidade Estadual de Santa Cruz
(UESC) - Ilhéus/BA, sob a orientação de Dr. Alexandre Schiavetti, Dr. Leonardo de Carvalho Oliveira e Dr. Yvonnick Le Pendu.

Devido à vulnerabilidade e exposição dos cetáceos a ameaças antrópicas, estudos relacionados às estratégias para conservação destes animais são necessários. O objetivo da presente pesquisa é avaliar a eficácia de Instituições voltadas a conservação de cetáceos marinhos no Brasil, Argentina, Uruguai e Estados Unidos da América.

Para isso, solicito a sua colaboração do (a) Sr. (a) em responder um formulário on-line que leva em torno de ao máximo uma hora para ser completamente respondido. Assim, esse formulário pode ser pausado e retomado em qualquer momento até seu total preenchimento.

Caso decida não participar do estudo, ou resolver a qualquer momento desistir do mesmo, não sofrerá nenhum dano e poderá fazê-lo inclusive após ter assinado o TCLE ou participado da coleta de dados. A divulgação dos resultados da pesquisa será realizada de forma anônima e garantirá a integridade do participante. Os superiores ou demais membros das Organizações entrevistadas não terão acesso às respostas dadas pelos participantes garantindo ao mesmo anonimato

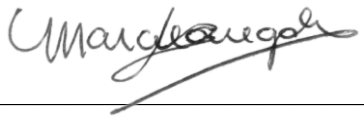
Riscos: Informamos que essa pesquisa pode por ventura gerar algum tipo de desconforto ou constrangimento em perguntas relacionadas aos recursos financeiros. Além de poderem se incomodar identificando falhas na execução de ações de conservação. Para evitar e reduzir qualquer eventual desconforto, manteremos sigilo dos dados pessoais coletados e vamos preservar a privacidade dos participantes. No momento da publicação dos nossos resultados, embora a identidade do participante esteja preservada, existe uma possibilidade de vinculação das respostas ao local de trabalho, ou espécie alvo de conservação do entrevistado.

Garantimos que sua participação é voluntária e possui plena liberdade de se recusar de participar da pesquisa ou retirar seu consentimento, em qualquer fase da pesquisa (inclusive após ter assinado o TCLE ou participado da coleta de dados), sem penalização alguma. Garantimos também que essa pesquisa não representa qualquer forma de gasto,

tampouco remuneração aos participantes e mesmo que não previsto, o (a) Sr. (a) tiver gastos decorrentes da pesquisa, será ressarcido. Garantimos o direito à indenização se o participante tiver qualquer dano decorrente da sua participação na pesquisa.

Benefícios: A maior contribuição desse estudo será identificar as lacunas que fazem essas Instituições falharem em seus objetivos de conservação e apontar os melhores caminhos para uma conservação eficaz. Como os esforços serão voltados a instituições inseridas em diferentes países, trará aprendizados a partir de diferentes contextos sociais. Todos os resultados da presente pesquisa serão retornados a (o) Sr. (a).

Estarei a sua disposição para qualquer esclarecimento e acompanhamento que considere necessário em qualquer etapa da pesquisa e inclusive considerando benefícios e acompanhamentos posteriores. Este TCLE poderá ser baixado on-line.



Pesquisadora: Marcela Marega Imamura

mmimamura@uesc.br

Sr(a) entrevistado, por favor, ao abrir o questionário on-line assinale a opção que esteja de acordo com a declaração seguir: Eu, convidado a participar da presente pesquisa, fui informado(a) dos objetivos e da relevância do estudo proposto, de como será minha participação, dos procedimentos e riscos decorrentes deste estudo. Declaro assim, que se eu assinalar a opção "concordo" estarei dando o meu consentimento em participar da pesquisa, como também concordando que os dados obtidos na investigação sejam utilizados para fins científicos (i.e. divulgação em eventos e publicações). Estou também ciente que terei acesso a uma via desse documento. Se eu assinalar a opção "discordo" significará que não irei participar dessa pesquisa.

Esta pesquisa teve os aspectos relativos à Ética da Pesquisa envolvendo Seres Humanos analisados pelo Comitê de Ética em Pesquisa (CEP) da Universidade Estadual de Santa Cruz. Em caso de dúvidas sobre a ética desta pesquisa ou denúncias de abuso, procure o CEP, que fica no Campus Soane Nazaré de Andrade, Rodovia Jorge Amado,KM16, Bairro Salobrinho, Torre Administrativa, 3º andar, CEP 45552-900, Ilhéus, Bahia. Fone (73) 3680- 5319. Email: cep_uesc@uesc.br. Horário de funcionamento: segunda a quinta-feira, de 8h às 12h e de 13h30 às 16h.

Autorização do Comitê de Ética e Pesquisa da Universidade Estadual de Santa Cruz – página de aprovação

UNIVERSIDADE ESTADUAL DE SANTA CRUZ - UESC

Plataforma Brasil

Continuação do Parecer: 3.318.801

Tipo Documento	Arquivo	Postagem	Autor	Situação
Informações Básicas do Projeto	PB_INFORMAÇÕES_BÁSICAS_DO_PROJETO_906491.pdf	26/04/2019 17:12:12		Aceito
Outros	Carta_resposta_CEPok.pdf	26/04/2019 17:09:26	MARCELA MAREGA IMAMURA	Aceito
Declaração de Pesquisadores	Declaracao_justificativa_ausencia_cartas_anuenciaok.pdf	26/04/2019 17:09:16	MARCELA MAREGA IMAMURA	Aceito
Outros	Instrumento_coleta_dados_MarcelaMI_form1ok.pdf	26/04/2019 17:08:56	MARCELA MAREGA IMAMURA	Aceito
Outros	Instrumento_coleta_dados_MarcelaMI_form2ok.pdf	26/04/2019 17:08:26	MARCELA MAREGA IMAMURA	Aceito
Projeto Detalhado / Brochura Investigador	projeto_detalhado_MarcelaMIok.pdf	26/04/2019 17:08:01	MARCELA MAREGA IMAMURA	Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	tcle_finalizado_MarcelaMI_fase2ok.pdf	26/04/2019 17:07:16	MARCELA MAREGA IMAMURA	Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	tcle_finalizado_MarcelaMI_fase1ok.pdf	26/04/2019 17:06:32	MARCELA MAREGA IMAMURA	Aceito
Outros	lattes_pesquisadora_principal_MarcelaMI.pdf	20/03/2019 15:20:44	MARCELA MAREGA IMAMURA	Aceito
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Outros	lattes_grupo_pesquisa2_MarcelaM.pdf	20/03/2019 15:19:39	MARCELA MAREGA IMAMURA	Aceito
Folha de Rosto	folha_rosto_MarcelaMI.pdf	20/03/2019 11:30:13	MARCELA MAREGA IMAMURA	Aceito
Declaração de Pesquisadores	6_termo_comp_MarcelaMI.pdf	15/03/2019 16:34:08	MARCELA MAREGA IMAMURA	Aceito
Declaração de Pesquisadores	1_declaracao_responsabilidade_pronto_MarcelaMI.pdf	15/03/2019 15:50:33	MARCELA MAREGA IMAMURA	Aceito
Declaração de Instituição e Infraestrutura	carta_de_anuencia_MarcelaMI.pdf	15/03/2019 15:49:48	MARCELA MAREGA IMAMURA	Aceito

Situação do Parecer:
Aprovado

Necessita Apreciação da CONEP:
Não

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Bairro: SALOBRINHO **CEP:** 45.662-900
UF: BA **Município:** ILHEUS
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Carta de Recomendação da Cetacean Society International

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4 July 2017

To: Coordinators of Non Governmental Organizations focused on cetacean conservation

Dear Coordinators or appropriate NGO Representatives;

Your participation is requested in the "Assessment of NGOs' effectiveness concerned to marine cetacean conservation in the Southwestern Atlantic". Cetacean Society International (CSI) is supporting this research because your organization and ours are always interested in assessing the effectiveness of our community's efforts, comparing methods and objectives, and making our combined work succeed.

This study is being accomplished by researchers from Universidade Estadual de Santa Cruz (UESC-Ilhéus/BA). With your cooperation and support this research will evaluate and diagnose the effectiveness of all NGOs focused on the conservation of marine cetaceans in the Southwestern Atlantic. Participation in this study is voluntary, but your NGO will profit from the results. If you have questions or are interested in learning about the evaluation methodology, please contact Marcela Marega Imamura <mmimamura@uesc.br>. CSI is supporting this research for its value to our NGO community and purpose, but we are not associated with the research and will have no access to the data.

Your NGO's participant will be asked to answer a questionnaire about the profile of your institution or organization, including questions that will help the researchers evaluate your management structure, programs, and methods for carrying out actions. The information obtained will be confidential, and the data and results will not identify the participants, focusing on their general content and statistical data.

This research will assist you and all participating NGOs, by identifying gaps and suggesting alternative ways for marine cetacean conservation. It is intended to contribute to a coordinated Management Plan for Brazil's Cetacean Whale and Dolphins Sanctuary, and to assist in the creation of the South Atlantic Whale Sanctuary.

Thank you for your participation in this research

William W. Rossiter
Director, Advocacy, Science and Grants